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Light-Duty Diesel Organic Particulate Control Technology Investigation

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Light-Duty Diesel Organic Particulate Control Technology Investigation

by

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FOREWORD

This project was initiated by the Control Technology Assessment and Characterization Branch, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105. The effort on which this report is based was performed by the Department of Emissions Research, Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas 78284. This project was authorized by Contract 68-03-2873, began on September 17, 1978, and was completed on March 16, 1983.

This project was identified within SwRI as 05-5810, and the Project Leader was Mr. Charles M. Urban. Mr. Charles T. Hare was the Project Manager, and was primarily responsible for the technical and fiscal negotiation of the initial project. The initial Project Officer at the Environmental Protection Agency was Mr. Andrew Kaupert. In chronological order, the subsequent Project Officers were Mr. John McFadden, Mr. Robert Wagner (acting), Mr. John Pointer, Mr. Robert Wagner (acting), and Mr. Larry Landman. Mr. Robert Wagner maintained a close involvement with this project throughout the entire period.

ABSTRACT

Methods for particulate, and associated organics, emissions control were evaluated in several diesel cars. Of the methods investigated, only "particulate traps" provided large reductions in particulate emissions. Traps evaluated included metal mesh and ceramic monolithic configurations, catalyzed and uncatalyzed. One of the cars, with a ceramic trap installed, completed eighty thousand kilometers of distance accumulation. No significant deterioration of emissions occurred over those eighty thousand kilometers.

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I. SUMMARY AND CONCLUSIONS

The objective of this study was to investigate technology with potential for control of organic material emitted by light-duty diesel vehicles. The study was designed to broaden the data base on particulate emissions from light-duty diesels, and to demonstrate the durability of the most effective technology evaluated. Involved in this study were baseline evaluations, screening of methods for particulate control, and system optimization and durability.

Three 1980 model diesel automobiles, representing a range of engine types and sizes, were used for the majority of the testing. They were a Mercedes-Benz 300D, an Oldsmobile Delta 88, and a Volkswagen Rabbit. The Mercedes-Benz and a subsequently-obtained 1982 model Datsun Maxima were involved in the durability evaluations, and a 1981 Mercedes-Benz was involved in an evaluation of water injection.

The emissions measurement procedure utilized in this study was the light-duty Federal Test Procedure. Trap durability and other distance accumulation utilized the 55 mph alternate Mileage Accumulation Procedure. Extraction of large filter samples, for determination of percent organic extractables and Ames evaluation, was conducted using methylene chloride as the solvent.

SCREENING FOR PARTICULATE CONTROL METHODS

Initially, a number of methods were evaluated to determine their potential for controlling particulate and organic emissions. The methods evaluated can be separated into three general areas: fuels, engine or operational modifications, and particulate traps.

Fuels - At the time this study was initiated, alternate fuels were of significant interest. Therefore, alternate fuels were included among the limited number of fuels evaluated in this study. The fuels evaluated covered a fairly wide range of fuel properties, and no really dramatic reduction in particulate emissions was obtained. None of the fuels evaluated indicated any reasonable possibility of meeting a 0.124 g/km (0.2 g/mi) particulate standard, with the Oldsmobile, through fuel formulation alone. In addition, the current emphasis is toward more lenient, rather than more restrictive, fuel specifications.

Engine and Operational Modifications - A number of engine and operational modifications were evaluated with the Oldsmobile, the Volkswagen, and a second Mercedes. With the Oldsmobile, road draft of the crankcase, removal of crankcase vent filters, and TRW elastomer rings were evaluated. None of these modifications had any noticeable effects on emissions. These data illustrate that, with an engine in good condition, potential reduction of crankcase blowby (all of these three modifications) or oil consumption (the TRW elastomer rings) had essentially no effect on particulates. Actual tests were not conducted to determine actual reductions.

With the Volkswagen, the modifications included engine shut-off at idle, and a dual-fuel, dual-injection system. Shutting-off the engine at idle, in FTP evaluations, reduced particulates and fuel consumption by approximately five percent. NO_x emissions were also reduced, while HC and CO were essentially unchanged.

The dual-fuel, dual-injection system evaluated with the Volkswagen used diesel pilot injection, with methanol as the primary fuel. This system provided good hot-start performance and resulted in significant reduction of particulates. HC, CO and energy specific fuel consumption increased substantially, however, and these values could not be reduced within the limit of effort allotted to this system.

A Mercedes 300SD with an experimental intake water injection system was evaluated. Although the purpose of this system was NO_x reduction, rather than particulate reduction, water injection was included in this study due to the reported interactions between particulate and NO_x emission control. With water injection, at an optimized rate of 60 to 70 percent of the fuel flow, NO_x was reduced 20 to 25 percent and particulates increased by approximately ten percent.

An important consideration is that the current NO_x humidity correction factor is inappropriate with water injection. The higher the humidity in the test cell, the greater the resultant effect of water injection on NO_x reduction. This effect of humidity is a very important factor in comparisons between NO_x data obtained when using water injection.

Exhaust Particulate Traps - A number of particulate traps were evaluated to determine trapping efficiency, increase in exhaust backpressure, and ease of regeneration. The trap substrates evaluated (in catalyzed and uncatalyzed form) included: ceramic honeycomb, ceramic foam, and metal mesh. The traps are representative of the various trap designs available at the time this study was conducted.

With these various traps, total particulates were initially reduced by 50 to 80 percent, and the amounts of organic extractables were reduced by 75 to 85 percent. In addition to reducing particulates, the catalyzed traps significantly reduced HC, and two out of three catalyzed traps reduced CO. An alumina-coated metal mesh trap also significantly reduced HC. NO_x was reduced with the traps that were installed on the Oldsmobile, probably due to the increase in EGR flow rate resulting from the increase in exhaust backpressure.

In general, regeneration of the traps could not be initiated below about 600°C (1100°F). With three of the traps, a Corning catalyzed and a W.R. Grace radial-flow catalyzed and uncatalyzed, effective regeneration was not obtained.

With the Corning catalyzed trap, burn-off of the carbon was apparently obtained, but return to near the initial pressure-drop across the trap did not occur. Incomplete regeneration of the two W.R. Grace radial-flow traps was due to a large temperature gradient along the outside diameter of the substrate. Regeneration of the entire trap would have required a trap inlet temperature about 750°C (1350°F).

Exhaust temperatures necessary for regeneration were generally obtained by throttling of the intake air at somewhat higher than highway speed and power (generally about 100 km/hr and 1.5 times the normal power requirement). All regenerations were conducted during operation on the chassis dynamometer in the laboratory. The total regeneration cycle (warm-up burnoff-cooldown) required ten to fifteen minutes. No attempt was made to develop a regeneration method or system that would be applicable to actual production vehicles, and the regeneration method used is only applicable to laboratory evaluations.

Other Particulate Control Evaluations Considered - A number of other evaluations related to particulate control were considered, but such evaluations were not directly included in this study. These included the following areas: turbocharging, air injection, engine modification, fuel system, and other items. Coordinated modifications to the combustion chamber and the injection system, along with parameter optimization, were beyond the scope of this study.

PREPARATION FOR TRAP DURABILITY

Initially, it was planned to conduct some evaluation of durability with each of three traps: a Corning noncatalyzed, a Johnson Matthey catalyzed, and a Texaco noncatalyzed. As the study progressed, 80,000 kilometers (50,000 miles) of durability was performed with the Corning trap, durability of the Johnson Matthey and Texaco traps was deleted, and durability of a NGK trap was initiated. The Corning and the NGK trap substrates were installed into their respective containers at this laboratory, using Interam insulation, in accordance with recommendations provided by a representative from Walker Manufacturing Company. The Johnson Matthey and Texaco traps were provided to this laboratory as complete assemblies.

Johnson Matthey Trap - It was indicated by the representative from Johnson Matthey that the catalyzed Johnson Matthey JM-13 trap could be effectively regenerated on the Oldsmobile, in spite of the lower exhaust temperatures produced. It was determined, however, that unless significant oxidizable compounds were present in the exhaust, this trap required essentially the same exhaust temperature as did all the other traps to initiate regeneration. While evaluating various methods suggested by the trap supplier, a catastrophic regeneration occurred, resulting in meltdown of the trap substrate. By the time a replacement trap could be obtained, Johnson Matthey was well along in conducting a durability demonstration of its own. Therefore, a decision was reached to delete the durability evaluation of a Johnson Matthey trap from this study.

Texaco Trap - A relatively rapid decrease in trapping efficiency was experienced with the Texaco trap at relatively small increases in pressure drop across the trap, and regeneration of this trap on the Oldsmobile was very difficult. As a result of these factors, primarily the decreases in efficiency and regeneration difficulties, durability evaluation of the Texaco trap was deleted from this study.

NGK Trap - A durability evaluation was initiated with the NGK trap on the Datsun Maxima. Throttling of intake air at highway speed and power setting was the method selected for use in regeneration of the trap. During the set-up of the regeneration technique, a catastrophic regeneration occurred, resulting in meltdown of the trap ceramic substrate. After installation of a replacement trap substrate, the set-up of the regeneration technique was completed.

Eight thousand kilometers (5000 miles) of durability was accumulated on the Datsun Maxima with the NGK trap. Trap regenerations were conducted every 320 kilometers of operation, when the pressure across the loaded trap was approximately double the pressure drop across the trap just after regeneration.

After the 8000 kilometers, the particulate emissions were double the initial values. Examination of the trap substrate revealed that a radial crack had occurred at about the longitudinal center of the substrate, and that the substrate had separated into two segments. The increase in particulates was due to bypassing at this crack. Due to limitations in the level of effort available, no further durability evaluation of the NGK trap was performed.

Corning Trap - Durability testing on the Corning trap was conducted on the Mercedes 300SD. With this system, good control was consistently maintained during regeneration. All regenerations were conducted in the laboratory on the chassis dynamometer, and all mileage accumulation was conducted in operation on the road. Nominal conditions for regeneration were a vehicle speed of 100 kilometers per hour, a dynamometer power setting of about 1.5 times the FTP power setting, and intake air throttling to obtain exhaust conditions of over 630°C (1160°F) temperature and about 3.5 percent oxygen concentration.

Doubling of the pressure drop across the trap occurred in four hours, or less, of vehicle operation over the service accumulation cycle. Such frequent regeneration would result in excessive operating costs, so an effort toward extending the interval between regenerations was evaluated. The interval was extended to eight hours (about 320 kilometers), and this change did not result in any driver complaints on performance of the vehicle or serious detrimental effects on regeneration. It did, however, extend the primary burning time for removal of the majority of the particulate from the trap. This eight-hour interval resulted in a trap loading of up to 100 grams of particulate and about a four-fold increase in pressure drop across the trap (from about 5 kPa or 20 inches H_2O after regeneration, to 20 kPa before regeneration at 64 km/hr).

The established regeneration cycle generally involved the following: two to three minutes, after throttling of the intake air, to initiation of carbon burn off; two to four minutes to burn off the majority of the particulate; and eight additional minutes to assure complete burn off of the particulate. Maximum exhaust gas temperature at the trap exit during regeneration was 760°C (1400°F), and the maximum temperature increase of the exhaust gas across the trap was 100°C. The rate of particulate burning was primarily controlled by the inlet temperature and the amount of oxygen available in the exhaust gas.

Emissions were measured during regeneration, and CO was the only emission that increased by a relatively large amount during regeneration. Regeneration of a fully loaded trap produced about 50 to 60 grams of CO. The overall average CO emission rate, for 2000 kilometers of city driving plus one regeneration, would be about one gram per kilometer. Smoke (opacity) measurements were not made during regeneration, but visual observation of the exhaust as it exited the stack did not indicate high levels were occurring.

The 1980 Mercedes 300SD, with the Corning noncatalyzed trap installed, was operated over 80,000 kilometers (50,000 miles) of service accumulation. The overall average values and the standard deviations for the entire 80,000 kilometers are as follows:

	FTP Emissions in g/km				Fuel,
	HC	CO	NO_x	Part.	ℓ/100 km
Average					
Without Trap	0.10	0.61	0.96	0.28	9.7
With Trap	0.07	0.61	0.92	0.027	9.8
Standard Deviation					
Without Trap	0.01	0.02	0.05	0.04	0.2
With Trap	0.01	0.02	0.05	0.004	0.2
Ratio of Avg. in %					
With/Without	70%	100%	96%	10%	101%

With the trap, particulate emissions were reduced by ninety percent and HC by thirty percent. Effects of the trap on CO, NO_x, and fuel consumption were relatively minor. The calculated particulate deterioration factor was 0.82 with the trap and 1.09 without the trap. By omitting one outlier data point, the deterioration factor without the trap installed would be 1.02. With the trap, the deterioration remained significantly below a value of 1, even with omission of any one data point. It appears that some improvement in trapping efficiency actually did occur during the durability period. No unscheduled maintenance was performed on the engine or the trap throughout the 80,000 kilometers of service accumulation, following the actual start of trap durability.

CONCLUSIONS

Of the evaluations conducted in this study, only particulate traps produced large decreases in exhaust particulates from light-duty diesel vehicles. Of the control methods considered, but not evaluated in this study, only coordinated modifications to the combustion system, injection system, and operating parameters are considered to have good possibilities for producing large reductions in particulates.

This study demonstrated that a particulate trap can function over 80,000 kilometers of service accumulation, when good control is maintained over the regeneration process. It also demonstrated that loss of control during the regeneration process can significantly affect the trap, with the effect ranging from efficiency loss to catastrophic failure. It is concluded that development of a reliable in-service regeneration process remains as the main obstacle to the application of particulate traps on production vehicles.

II. INTRODUCTION

This report describes the effort to investigate methods for reducing total and organic particulate emissions from light-duty diesel vehicles.

A. Project Objective

The primary objective of this project was to determine the potential of various particulate emission control methods for control of total and organic particulate matter from light-duty diesel vehicles. Additional objectives were to broaden the data base for total and organic particulates, and to provide an initial demonstration of the potential durability of the most promising particulate control methods.

B. Particulate Emission Controls Evaluated

Evaluations conducted involved: fuels, engine and operational modifications, and particulate traps. The fuels ranged from a low sulfur No. 1 Diesel fuel to the addition of alcohols.

Engine and operational modifications involved such things as the crankcase vented to the atmosphere, zero blowby piston rings, engine shut-off at idle, dual-fuel with dual-injection, and water injection. Several particulate traps from a number of manufacturers were evaluated, including Corning, Johnson Matthey, Texaco, W.R. Grace and NGK. Trap configurations included were ceramic honeycomb, ceramic foam, and metal mesh. Several configurations were evaluated in both catalyzed and noncatalyzed versions.

C. Emissions Measurement Procedures

For all emissions, except particulates, the procedure for certification of light-duty diesel-powered vehicles was followed.(1)* For particulates, the Proposed Rules for particulate regulation was followed initially, until the final rule was published.(2) The organic extraction of large filter samples was performed by this laboratory, and the Ames analyses were performed by another EPA contractor.

D. Vehicles Evaluated

Diesel cars included in this project were: a 1980 Mercedes 300SD, a 1980 Oldsmobile Delta 88, a 1980 Volkswagen Rabbit, a 1981 Mercedes 300SD, and a 1982 Datsun Maxima. The 1981 Mercedes 300SD and the 1982 Datsun Maxima were each included in only one specific phase of this project.

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*Numbers in parentheses designate references at the end of this report.

The cars are briefly described as follows:

Car	Description	Engine*	
61	1980 Mercedes-Benz 300SD	3.0 Liter I-5	TC
62	1980 Oldsmobile Delta 88	5.7 Liter V-8	NA
63	1980 Volkswagen Rabbit	1.5 Liter I-4	NA
64	1981 Mercedes-Benz 300SD	3.0 Liter I-5	TC
65	1981 Datsun Maxima	2.8 Liter I-6	NA

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*TC - Turbocharged, NA - Normally Aspirated

III. TEST PLAN, EQUIPMENT AND INSTRUMENTATION

This section describes the test plan and the facilities, instrumentation, procedures, and fuels utilized in this project. The cars utilized in this project are described in Section IV.

A. Test Plan

This project was divided into five tasks: vehicle procurement, baseline testing, evaluation of particulate and organic emission control technology, system optimization and durability testing, and final reporting. This basic test plan was followed throughout the project. Due to the rapidly changing technology for particulate control, however, the details of the plan changed considerably as the project progressed. For example, particulate traps were initially intended to be only one of many aspects of this project. Of the methods and systems evaluated, however, only particulate traps provided large reductions in particulate. Thereafter, evaluations of particulate traps dominated all subsequent activities in this project.

It was desired that the three primary diesel cars for use in this project provide reasonable representation of the range of sizes and types of engines available. The cars initially selected were a Mercedes 300D, an Oldsmobile with a 350 CID diesel, and a Volkswagen Rabbit diesel (the Mercedes 300D was subsequently changed to a 300SD). These cars were considered to be representative of over three-fourths of all the diesel cars in operation in the United States at the time of selection. Subsequently, two additional cars were obtained for use in specific evaluations.

Each of the initial three cars was to undergo about 6400 kilometers (4000 miles) of distance accumulation, followed by triplicate emissions tests. This was to be followed by a relatively extensive tune-up to manufacturer's specifications and a repeat of the emissions testing. The emissions testing was to include measurement of gaseous emissions by the certification procedure(1) and particulate emissions by the proposed rules.(2) (The rules for particulate emissions became final before the end of this project). In addition, large filter particulate samples were to be collected and extracted for use in Ames analyses.

The evaluation of potential particulate control methods and systems (screening evaluations) was to include a wide variety of approaches. The scope was initially limited only by the availability of necessary components; this subsequently proved to be a major limitation. Combustion chamber modifications and fuel injection system modifications were not included in the final list of methods to be evaluated.

System optimization and durability testing were to be conducted on up to three of the most promising control methods identified by the screening evaluations. The goal of the durability testing was 80,000 kilometers (50,000 miles). Duplicate gaseous and particulate emissions evaluations were to be conducted initially and after each 8000 kilometers, with and without the control system on the vehicle. Large filter samples were initially required at the zero and 80,000 kilometer test points; this was subsequently changed to more frequent intervals.

In summary, this project was conducted during a period of rapidly changing technology for, and attitudes toward, the control of diesel particulate. The test plan for this project changed accordingly. The methods and systems that were evaluated are described in Section V of this report.

B. Dynamometer and CVS System

A Clayton Model ECE-50 chassis dynamometer, with a direct drive variable inertia flywheel system, was utilized for all transient testing. This system, SwRI Dynamometer Number 2, enables simulation of equivalent weights of vehicles from 454 to 4026 kg in 57 kg increments (1000 to 8875 pounds in 125 pounds increments).

The constant volume sampler (CVS) used in this project was SwRI CVS Number 3. This unit has a nominal capacity of 12.6 m^3/min (445 scfm). An auxiliary system used with the Mercedes and Oldsmobile had a capacity of 3.4 m^3/min (120 scfm); this provided a total capacity of approximately 16 m^3/min (565 scfm). A nominal 460 mm (18 inch) diameter by 5 m (16 feet) long dilution tunnel was used between the intake filter and the CVS to enable sampling of particulates. During operation on the dynamometer, a 142 m^3/min (5000 cfm) cooling fan was placed in front of the car's radiator.

Views of the chassis dynamometer, the dilution tunnel, and the CVS are shown in Figure 1. The dynamometer and CVS were calibrated, maintained, and operated in accordance with the manufacturer's instructions and the appropriate sections of the Code of Federal Regulations applicable to light-duty diesel vehicles.(1)

C. Exhaust Sampling and Analysis

Exhaust samples taken were continuous for HC emissions, bags for other regulated gaseous emissions, and 47 mm Pallflex filters for particulates. Additional samples occasionally taken were 500 mm by 500 mm (20 inch) Pallflex filters for organic extraction, and 47 mm glass fiber or Fluoropore filters for various other analyses. The sampling of the 47 mm Pallflex filters was conducted in accordance with the rules for particulate emissions from light-duty vehicles.(2) Similar sampling criteria were utilized for all other filter samples.

The bagged samples were evaluated for CO, CO_2 and NO_x using an emissions measurement cart (SwRI Bag Cart Number 1) meeting the requirements for certification of light-duty vehicles.(1) Hydrocarbon emissions were measured continuously using heated sample lines and a heated detector (maintained at 190°C), and the emissions rate was determined by integration of the continuous sample. The amount of particulate collected was determined by weighing the filter on a microbalance before and after sampling. For all filter samples, the temperature in the sampling zone was maintained below 52°C (125°F).

Large (i.e., 500 mm) Pallflex filters were used to collect particulate for extraction. These filters are weighed to determine the particulate loading, then stored in glassine bags within a brown paper envelope. These envelopes are then sealed in Tedlar bags purged with nitrogen, and the Tedlar bags are stored in a freezer until needed for extraction. These steps generally take place within a few hours of sample collection, and are carried out under yellow light (ultraviolet light filtered out using Kodak "yellow chrome II" film).

As required, the respective filters are removed from freezer storage and extracted in soxhlet extractors. After adequate cycling time, the solvent (methylene chloride) containing the extractables is filtered, then evaporated to "dryness" in a preweighed vial using blown-in nitrogen. The weight of the "dried" extract is determined, and the SOF percent of total particulate calculated. "Dried" refers to the complete removal of the solvent. The vial contents are either distributed for analysis or stored in the freezer for subsequent analysis or shipment. As with filter handling, all extraction steps were carried out under yellow light. Details of the extraction procedure are given in Reference 3.

D. Emissions Test and Mileage Accumulation Procedures

The primary emissions test procedure utilized in this project was the Federal Test Procedure, used for certification of light-duty vehicles. This procedure uses the Urban Dynamometer Driving Schedule (UDDS) which is 1372 seconds in duration. The UDDS, in turn, is divided into two segments, the first is a transient segment of 505 seconds, and the second is a stabilized segment of 867 seconds. This Federal Test Procedure consists of cold-start transient and stabilized segments followed by a hot-start transient.

The Modified Durability Driving Schedule (MDDS) was used for distance accumulation on the road.(4) This driving schedule consists of starts and stops, wide-open throttle and normal accelerations, and has considerable idling time. The maximum speed is 88 km/hr (55 mph), and the average speed is between 40 and 48 km/hr (25 and 30 mph).

E. Fuels and Lubricant

The Number 2 Diesel fuels used for baseline emissions evaluations and for distance accumulation are described in Table 1. Differences between these three batches of fuels are relatively minor.

An engine oil was selected that could be used in all of the initial three cars. The Oldsmobile specified SAE 30 above 30°C (86°F), and the Mercedes listed only seven factory-approved standard single-viscosity oils.

TABLE 1. DESCRIPTION OF NUMBER 2 DIESEL FUELS USED

	Test Fuel Specification(1)	Compliance Diesel Fuel DF-2[a]		
		EM-408[b]	EM-456[c]	EM-487[d]
Cetane Number	42-50	47	45.3	45.3
Distillation Range, °F				
IBP	340-400	373	345	354
10% Point	400-460	443	423	417
50% Point	470-540	506	498	486
90% Point	550-610	602	581	570
EP	580-660	659	635	632
Gravity, °API	33-37	36.3	34.9	35.9
Density, g/mℓ	--	0.843	0.850	0.845
Total Sulfur, %	0.2-0.5	0.28	0.29	0.26
Hydrocarbon Composition, %				
Aromatics	27 minimum	32.7	31.6	32.8
Flash Point, °F (minimum)	130	178	161	154
Viscosity, Centistokes	2.0-3.2	2.8	2.7	2.5

---

[a] Blended by Amoco Oil Company Laboratory Services
[b] Used in Task II and part of Task III
[c] Used in Task III, and used for emissions testing of the Mercedes in Task IV
[d] Used for distance accumulation of the Mercedes and the Datsun, and for emissions testing of the Datsun, in Task IV.

An oil for Service API/SE CC was specified for all three cars. Based on these criteria, along with oil brand market share and availability, Quaker State HD Motor Oil SAE 30 was selected for use throughout this project. Pennzoil Multi-Duty Motor Oil SAE 30, for Service API/SF CD, was used in the 1982 Datsun Maxima.

IV. VEHICLE PROCUREMENT AND BASELINE EMISSIONS

These project tasks involved locating and procuring three selected light-duty diesel cars, and conducting baseline emissions evaluations.

A. Vehicle Procurement - Task I

After making a comparison of the advantages and disadvantages of leasing and of purchase with subsequent resell, leasing was selected for use in this project. Three 1980 model-year, diesel cars (VW Rabbit, Mercedes-Benz 300SD, and Oldsmobile Delta 88) were acquired on renewable, twelve-month lease agreements. All three were new cars obtained by the lessor through local new car dealerships. These cars are described in Table 2.

The Mercedes and the Oldsmobile had three-speed automatic transmissions, while the VW Rabbit had a four-speed manual transmission. The engines in the Oldsmobile and VW Rabbit were naturally-aspirated, and the engine in the Mercedes was turbocharged. The weight of the VW Rabbit was a little over half that of either the Mercedes or the Oldsmobile.

The chassis dynamometer setting given in the table were those used in certification. It was noted that the dynamometer power to weight ratio was significantly different for the Mercedes (Car 61), relative to the other two cars in the program at that time. This difference is illustrated as follows:

Car Number	Inertia, Pounds	Power, Horsepower	Power ÷ Inertia	
			Actual	Relative
61	4000	13.0	0.0033	113%
62	4250	12.2	0.0029	100%
63	2375	6.8	0.0029	100%

As shown, the Mercedes (Car 61) was tested at a power to weight ratio that is 13 percent higher than the ratio for the other two cars included in this project. It appeared logical that the Mercedes should have had an actual power to inertia ratio about equal to that for the other two cars. If that is true, then the horsepower setting on the Mercedes should have been about 11.5.

A representative of Mercedes-Benz was contacted concerning the certification horsepower value. He stated that Mercedes-Benz used a horsepower based on frontal area for 1980 and plans to determine and use actual horsepower for future years. Based on the limited data he had available, he anticipated a ten to fifteen percent reduction from the current 13.0 horsepower (for the 1982 model year, the Mercedes 300SD was certified at 11.5 horsepower, with 4000 pounds inertia as is the case with Car 64).

TABLE 2. DESCRIPTION OF DIESEL TEST CARS

Car Number	Vehicle			
	Year	Make and Model	Body Type	Serial Number
61	1980	Mercedes-Benz 300SD (116120)	4-dr	116120-12-019282
62	1980	Oldsmobile Delta 88	4-dr	3N69NAX 133393
63	1980	Volkswagen Rabbit (175391)	2-dr	17A0837864
64[a]	1981	Mercedes-Benz 300SD	4-dr	WDBCB20A7BB000501
65	1982	Datsun Maxima	4-dr	JN1SU1S4CT014423

Car Number	Engine				EGR
	Disp.	Cyl.	Description	Serial Number	
61	3.0	I-5	Turbocharged	617950 12 019581	No
62	5.7	V-8	Naturally Aspirated	--	Yes
63	1.47	I-4	Naturally Aspirated	--	No
64	3.0	I-5	Turbocharged	617951 12 000497	Yes
65	2.8	I-6	Naturally Aspirated	LD28/079804	Yes

Car Number	Chassis Dynamometer Settings			
	Inertia, Kilograms	Power Kilowatts	Inertia, Pounds	Power, Horsepower
61	1814	9.7	4000	13.0
62	1928	9.1	4250	12.2
63	1077	5.1	2375	6.8
64	1814	8.6	4000	11.5
65	1474	7.0	3250	9.4

Car Number	Transmission	Tires	Other
61	Automatic-4	Michelin 185 HR 14XVS	A/C, P/S & P/B
62	Automatic-3	Goodyear 75R15 Radials	A/C, P/S & P/B
63	Manual-4	Michelin XZX 155 SR 13 Radials	A/C
64	Automatic-4	Pirelli Cinturado P3 195/70 SR 14	A/C, P/S & P/B
65	Automatic-3	GT Special Steel 185/70 SR 14	A/C, P/S & P/B

Car Number	Odometer Miles	Source
61	39	Alamo Leasing Co. (56)
62	44	Alamo Leasing Co. (5932)
63	26	Alamo Leasing Co. (1836)
64	1700	Mercedes-Benz of North America
65	370	Alamo Leasing Co. (9376)

---

[a] Additional information on Car 64 is included in Appendix A-1.

Use of a modified horsepower setting on the Mercedes (Car 61), more in line with that for the other two cars, was considered. Such a setting was considered to be more applicable for the future and enable better comparison of the data between the three cars. The decision reached by the EPA Project Officer, however, was that the certification horsepower value of 13.0 should be utilized in this project.

B. Baseline Emissions - Task II

This project task involved 6440 kilometers (4000 miles) of distance accumulation, followed by triplicate emissions evaluations, conducted before and after tune-up to manufacturer's specifications. Cars 61, 62, and 63 were involved in this task.

1. Mileage Accumulation and Maintenance

In accordance with the break-in recommendations in the operator's manuals, moderate engine speeds and vehicle accelerations were maintained for the first 1600 kilometers. At 1600 kilometers, each of the cars received an inspection and the engine oil and the oil filter were replaced. The inspections of the Mercedes and the VW Rabbit were warranty requirements and were conducted by the dealers from whom the cars were obtained. The inspection of the Oldsmobile was conducted by a qualified technician at this laboratory.

Service and scheduled maintenance, with the exception of oil and filter replacement, were conducted in accordance with the specified requirements of the respective manufacturers. The engine oil and the oil filter were replaced after the first 1600 kilometers (1000 miles) and then at 4800 kilometer (3000 miles) intervals on all three of the cars. These distances are equal to the minimum specified among the three cars and, therefore, are less than those specified for two of the cars.

A single batch of Number 2 Diesel fuel was used throughout this baseline evaluation task. This fuel met the requirements for service accumulation and emissions testing, and was representative of the 1979 overall national average for 2D fuels. A single-viscosity motor oil, for service API/SE CC, was used in all three of the cars. This oil met the specifications for all three of the cars.

No problems were encountered with any of the cars throughout the 6400 kilometers of distance accumulation. During the testing after the 6400 kilometers, one of the fuel injectors on the Oldsmobile developed a leak, which was readily repaired. Following the initial series of tests, conducted after the 6400 kilometers, each car was given a thorough inspection.

In each case, the inspection and tune-up was conducted by a local new car dealership. At each dealership, the basic requirements were discussed with the service manager and he in turn passed the intent of these tune-ups to the service writer assigned to the job. The results of the tune-up are summarized in Table 3. No significant problems were noted with any of the three cars.

TABLE 3. TUNE-UP AFTER 6400 KILOMETERS

Description	Cars		
	61-Mercedes	62-Oldsmobile	63-Volkswagen
Standard Maintenance:[a]	5000[b]	27,000 & 30,000 mile	15,000 mile
Adjustments Required	Exh. Valves were .016-0.21 set @ .016	Idle was 680/690 Idle set 600/750 Adj. Alternator belt	None
Injection Timing	Met Factory Specs.	Met Factory Specs.	was 1.10 mm Adj. to 1.15 mm
Injection Quality:			
Spray Pattern	--	--	Good
Injection Press.,psi[c]	--	1100-1200	1700
Leakage	--	Bleed O.K.	None
Cylinder Compression, lbs.	300-341	400-440	450-475
Other Problems Noted	None	None	None

---

[a] Maintenance mileage selected to provide thorough inspection. A few non-essential items were omitted.

[b] Additional inspections performed were valve clearance and idle speed.

[c] Pressure at which injector opens (called crack, breaking or popping pressure)

2. Sampling Zone Temperature

The proposed standard specified that the sampling zone temperature should not exceed 51.7°C (125°F). This requirement presented a difficulty with the Mercedes 300SD. Some of the pertinent factors concerning this situation are briefly described as follows:

- The EPA reportedly ran a Mercedes-Benz with a CVS flow of 540 scfm and did not exceed 125°F
- In initial determinations in this project using 560 scfm, the peak temperature reached 143°F.

This was discussed in detail with the EPA Project Officer, who in turn discussed this problem with other individuals at the EPA. It appears that:

- The difference in peak temperature at the two laboratories was apparently due to the laboratory practices followed.
- By following the laboratory practices reportedly used at the EPA, it should be possible to maintain the peak temperature at or below the 125°F limit.

Additional discussion involved methods that could be applied to enable testing of the Mercedes:

- Waiving of the 125°F Limit - The SwRI system utilized a tunnel heater to preheat the tunnel to 100°F. In one hot-start transient test the heater was inadvertently left on and the results were as follows:

	Peak °F	Particulate, mg	Efficiency, %
63 BL-1	124	2.6	97
63 BL-2	121	2.8	97
63 BL-3	125	2.4	97
63 BL-3	135*	2.8	96

---

*Greater than 125°F for 100 seconds of the 505 total

This one data point does not indicate that there is any extremely important effect of sample zone temperature.

- Higher CVS Flow Rates - Using the current laboratory practices at SwRI (such as short connections from vehicle exhaust to the tunnel, mid-range test cell temperature, and preheating of the tunnel), a CVS flow rate over 800 scfm would be required to keep the peak temperature below 125°F. Such high dilution has detrimental effects on emissions measurement accuracy and could make it impossible to get a two milligram loading on the filter when control systems are used. In addition, such a high dilution volume was not anticipated (based on the results obtained at the EPA) and was not readily available for use in this project.
- Use of Actual Horsepower - As discussed in Section IV.A., the 13.0 horsepower setting is out-of-line relative to the horsepower settings of the other two cars. A horsepower setting around 11.5 could have been more appropriate, and would have reduced the peak temperature by an unknown amount.

- Use of Double Dilution - Double dilution would have required development and verification of a system which was outside the scope of work in this project. Also, the 500 mm Pallflex filter temperature would still have to be taken into account when large filter samples are taken. Therefore, double dilution would have only resolved one part of the problem.

- Following of Specific Requirements in the Standard - When the Mercedes was tested at the EPA, the exhaust connection was longer than that used at SwRI, and the tunnel was not preheated. Also, the test cell temperature may have been somewhat lower. By using a longer exhaust connection, deletion of tunnel preheating, and reduced test cell temperature, the 125°F limit could be met. This appeared to be the most feasible method, allowed by the proposed standard, for use in this project.

The criteria that was evaluated, for keeping the sample zone temperature below 125°F with the Mercedes, are as follows:

- Use of 12 feet of 4.0 inch diameter tubing between the vehicle and the dilution tunnel.

- Reduce test cell temperature as necessary, to as low as 68°F.

- Discontinue preheating of the tunnel, if necessary.

These criteria were considered to be a feasible means of meeting the specified requirements in the proposed particulate standard and were generally in keeping with the laboratory practices reportedly utilized at the EPA in testing a Mercedes. Preheating of the tunnel, to the average temperature obtained during the test, was retained; since it is considered to be a good operating practice and was found to have an almost negligible effect on the peak tunnel temperature.

3. Baseline Emissions Test Results

Triplicate emissions evaluations were conducted on each of the three cars, before and after the tune-up at 6400 kilometers of service accumulation. These evaluations involved the Federal Test Procedure, with determination of HC, CO, NO_x and particulate.

The results of these baseline emissions evaluations are given in Tables 4 and 5, and the computer printouts are included in Appendix B. In Table 4, the certification values and the standards are included, along with the average values for the baseline emissions results. The tests are identified by the test number as follows:

BL - Initial Baseline Evaluations

TU - Evaluations after Tune-Up

TABLE 4. AVERAGE BASELINE FTP EMISSIONS AND CERTIFICATION VALUES

	Emissions, g/km			
	Initial	Tuned-Up	Cert.	Standard
Car 61-Mercedes				
HC	0.11	0.10	0.13	0.25
CO	0.51	0.52	0.67	4.35
NO_x	1.02	1.08	1.03	1.24
Particulate	0.22	0.22	--	(0.37)[a]
Car 62-Oldsmobile				
HC	0.39*	0.32*		0.25
CO	0.87	0.74		4.35
NO_x	0.75	0.75		1.24
Particulate	0.32	0.28	--	(0.37)[a]
Car 63-Volkswagen				
HC	0.15	0.17	0.23	0.25
CO	0.58	0.54	0.72	4.35
NO_x	0.74	0.74	0.65	1.24
Particulate	0.22	0.22	--	(0.37)[a]

* Values which exceeded the emission standards.
[a] Particulate standard for 1983.

Referring to the data in Table 4, except for HC emissions from the Oldsmobile, all emissions were below the standards for 1980. The emissions from the Mercedes and the Volkswagen were in reasonably good agreement with the certification emissions values. Based on particulate emissions data for similar vehicles obtained from the EPA Project Officer, the particulate data on these three cars appear to be within the range of values that would be expected.

In the third test after tune-up with the Volkswagen, the fuel consumption was significantly lower than in the first two tests. Therefore, a fourth test was run and the results were as follows:

Test	Emissions, g/km				Fuel, ℓ/100 km
	HC	CO	NO_x	Part.	
63TU-4	0.20	0.55	0.81	0.238	6.28

These results indicate that the decrease in fuel consumption was real.

TABLE 5. BASELINE FTP EMISSIONS TESTS RESULTS

Test Results for 1980 Mercedes 300SD

		Emissions, g/km				Fuel,
Test	Description	HC	CO	NO_x	Part.	ℓ/100 km
61BL-1	At 6500 km	0.12	0.52	1.01	0.211	9.84
61BL-2	At 6500 km	0.13	0.49	1.03	0.218	9.78
61BL-3	At 6500 km	0.09	0.52	1.03	0.216	9.75
61BL	Average	0.11	0.51	1.02	0.215	9.79
61TU-1	After tune-up	0.11	0.54	1.06	0.226	10.06
61TU-2	After tune-up	0.10	0.49	1.07	0.213	10.49
61TU-3	After tune-up	0.10	0.52	1.10	0.230	10.18
61TU	Average	0.10	0.52	1.08	0.223	10.24

Test Results for 1980 Volkswagen Rabbit

		Emissions, g/km				Fuel,
Test	Description	HC	CO	NO_x	Part.	ℓ/100 km
63BL-1	At 6500 km	0.13	0.56	0.72	0.211	6.50
63BL-2	At 6500 km	0.15	0.60	0.76	0.230	6.49
63BL-3	At 6500 km	0.16	0.57	0.74	0.214	6.50
63BL	Average	0.15	0.58	0.74	0.218	6.50
63TU-1	After tune-up	0.17	0.54	0.73	0.218	6.62
63TU-2	After tune-up	0.17	0.61	0.79	0.229	6.57
63TU-3	After tune-up	0.16	0.48	0.71	0.213	6.20
63TU	Average	0.17	0.54	0.74	0.220	6.46

Test Results for 1980 Oldsmobile Delta 88

		Emissions, g/km				
Test	Description	HC	CO	NO_x	Part.	ℓ/100 km
62BL-1	At 6500 km	0.40	0.81	0.76	0.295	12.11
62BL-2	At 6500 km	0.35	0.91	0.74	0.328	12.04
62BL-3	At 6500 km	0.43	0.90	0.77	0.333	12.30
62BL	Average	0.39	0.87	0.75	0.319	12.15
62TU-1	After tune-up	0.33	0.72	0.78	0.270	11.43
62TU-2	After tune-up	0.34	0.76	0.75	0.307	11.59
62TU-3	After tune-up	0.28	0.73	0.72	0.258	11.49
62TU	Average	0.32	0.74	0.75	0.278	11.50

4. Organic extractions

In the baseline evaluations, particulate samples were taken on 500 millimeter square (20 by 20 inch) Pallflex filters, and these filters were shipped to an EPA-designated organization for analyses. Additional particulate samples, taken on 500 millimeter square Pallflex filters, were subsequently extracted at this laboratory to determine the percent of organic extractables in the particulate.

Initially, it was planned to determine the percent of organic extractables by extraction of 47 mm filters. The low total loading of particulates, along with the relatively large extraction analysis error, generally produced results having unacceptable large variations. The error associated with the extraction process, was found to be approximately 0.2 mg and to be essentially independent of the total amount of solubles present. As an example, consider a particulate loading 4.5 mg (mid-point of the 2 to 7 mg recommended in the standard), with 20 percent organic extractables. The nominal extraction analysis error would be about one-fourth of the organic extractables present. With 2 mg particulate and 10 percent extractables, the error would equal the amount of extractables present.

With the 500 mm square filter, relative to the 47 mm filter, the total loading of particulates is over 100 times as great and the extraction analysis error is only about five times as large. In the previous examples given, the extraction analysis error, when using 500 mm filters, would only be about one percent and five percent, respectively, of the total amount of extractables present. Therefore, with the concurrence of the EPA Project Officer, all determinations of organic extractables involved the use of the 500 mm square Pallflex filters.

Results of organic extractions conducted in the baseline evaluations are given in Table 6. The organic extractables, with the Oldsmobile and the Volkswagen, were 20 to 30 percent of the total particulate collected. With the Mercedes, however, the organic extractables were only 7 to 8 percent of the total particulate. Two sets of filters, one set before the tune-up and one after, were extracted to verify these results with the Mercedes. The reason for the significantly lower organic extractables, with the Mercedes, is not known. This was discussed with a representative of Mercedes, and the pre-chamber designs for each of the three engines were examined. It appears that pre-chamber design could be a significant factor. Engine combustion system modifications, in an attempt to determine the reason for the low organic extractables, was considered to be outside the scope of work for this project.

TABLE 6. BASELINE ORGANIC EXTRACTABLES

Car & Test	UDDS Cycle	Filter Number	Particulates, mg[a]		Percent Extrac.[b]
			Total	Extractable	
Mercedes 61TU-1	Cold	-5	685	49.8	7.3
	Hot	-6	628	46.4	7.4
	Composite[c]		653	47.9	7.3
Olds 62TU-1	Cold	6010	751	170	22.6
	Hot	6011	631	153	24.2
	Composite[c]		683	160	23.5
VW 63BL-3	Cold	6006	602	152	25.3
	Hot	6007	508	167	32.9
	Composite[c]		548	161	29.3
Mercedes 61BL-2	Cold	-3	637	49.2	7.7
	Hot	-4	552	45.7	8.3
	Composite[c]		589	47.2	8.0

---

[a] Using a 500 mm square Pallflex filter

[b] Percent Extrac. = Extractables ÷ Total × 100%

[c] Composite = 0.43 × Cold + 0.57 × Hot

5. Fuel Consumption Comparisons

The baseline fuel consumption values, along with the values from the 1980 Gas Mileage Guide, are as follows:

Car	Average Fuel Consumption, ℓ/100 km			
	Distance Accum.[a]	FTP		
		Initial	Tuned-Up	GMG[b]
61 Mercedes	11.2	9.8	10.2	9.8
62 Oldsmobile	12.6	12.2	11.5	10.7
63 Volkswagen	6.5	6.5	6.5[c]	5.9

---

[a] Average value from 1600 to 6440 kilometers of distance accumulation

[b] Gas Mileage Guide

[c] Average of the third test and an additional test (TU-3 and TU-4) was 6.2,

For the distance accumulation, fuel consumption was determined from the volumetric amount of fuel added. For the FTP evaluations, fuel consumption was calculated using the carbon balance method.

Fuel consumption during the distance accumulation was equal to or greater than in the FTP evaluations. This is in agreement with the results that were obtained with gasoline cars in a previous project.(5) Fuel consumption, after tune-up in the baseline FTP evaluations, was within three to ten percent of that given in the Gas Mileage Guide. The ten percent difference occurred with the Volkswagen. Using the average for the third test and an additional test (TU-3 and TU-4), the difference was only six percent, rather than ten percent.

V. PARTICULATE EMISSION CONTROL - TASK III

This task involved evaluation of particulate emission control technology and the screening of selected control methods. Significant changes occurred in this task as the evaluations progressed, in accordance with the status of control technology.

A. Test Plan Development

Initially, the EPA was to provide the system hardware and this laboratory was to conduct a prescribed test sequence on each control system provided. It was subsequently determined that some systems could not be readily obtained in this manner and that the same test sequence was not appropriate for all of the systems or methods evaluated. Therefore, the EPA Project Officer requested that this laboratory become involved in procuring several of the items and systems (including purchase or fabrication) and to modify the test sequence as appropriate for each system or method evaluated.

Significant changes occurred in the list of control systems and methods to be evaluated. One of the major changes in emphasis was associated with diesel particulate traps. Initially such traps were to have only a minor involvement in this task. As this task progressed, however, the evaluation of particulate traps consumed a considerable portion of the effort.

The primary criterion utilized in these screening evaluations was reduction of total particulates and organic fraction. Initially, it was considered desirable to utilize the results of Ames evaluations, but the long delays associated with obtaining Ames analyses made this impractical.

A number of control technology items, which were considered for possible inclusion in this task, were not evaluated. Reasons for excluding these items were unavailability, an apparent low probability of success, or their being considered outside the scope of work in the project. Most of these items are listed as follows:

Control Technology Items Considered, But Not Evaluated Experimentally

1. Variable Area Turbocharger
2. High Pressure-High Rate Injection
3. Lubricant Evaluations
4. Turbocompounding
5. Insulated Engine Components
6. Close Coupled Catalysts
7. Combustion Chamber Modifications
8. Variable Compression Ratio
9. Fumigation
10. N/V Optimization
11. "Computer" Fuel Control
12. EGR
13. Intake Throttling
14. Turbo Retrofit
15. CAV Microjectors (poppet type)
16. Air Injection
17. Hypergolic Injection

The particulate control systems and methods evaluated are listed in Table 7. The term "trap" has been used to identify all devices that remove and store the particulate. Test numbers were developed from a prioritized list that was obtained from the EPA Project Officer. Subsequent changes, involving deletions and additions of evaluations and the performance of the evaluations on another car, resulted in some gaps in the test numbers. Not shown in the table are the many baseline check evaluations that were run periodically. These were run to assure that no major changes in emissions had occurred with any car in its standard configuration.

TABLE 7. DIESEL PARTICULATE CONTROL SCREENING EVALUATIONS

	Test Identification Numbers			
	Mercedes Car 61	Oldsmobile Car 62	Volkswagen Car 63	Mercedes Car 64
Baseline No. 2 Fuel	611	621	631	641
No. 1 Low Sulfur Fuel		622		
Low Sulfur Shlae Oil		623		
10% n-Butanol in No. 2		624		
Road Draft		625		
TRW Easltomer Rings		626		
Corning Catalyzed Trap		627		
J-M Catalyzed Trap		628		
2 Cylinder - 1700 IW			632	
Idle Shut-Off			633	
Dual Fuel-Dual Injection			636	
Corning Noncatalyzed Trap	613			
EGR and Water Injection				644
Texaco Catalyzed Trap	616			
W.R.Grace Axial Non-Cat. Trap	617			
W.R.Grace Radial Cat. Trap	618			
W.R.Grace Radial Non-Cat. Trap	619			
Add Methanol at 64 km/h		62S	63S	

B. Topical Index to the Evaluations Conducted

This section arranges the evaluations conducted by topics, describes the systems evaluated, and identifies the section of the report in which the results are presented. The resultant topical index is given in Table 8.

1. Fuels Evaluated

Fuels evaluated in the Task III screening evaluations were a 1-D low sulfur diesel fuel, a low sulfur "2-D type" fuel derived from shale oil, and a blend containing 90 percent 2-D fuel and 10 percent n-butanol. The properties of these fuels are briefly summarized in Table 9, with additional detail given in subsequent Table 17. Additional fuel-related evaluations involved the addition of methanol to 2-D fuel just prior to the injection pump, and the addition of methanol into the combustion chamber using a dual-injection system.

TABLE 8. TOPICAL INDEX TO EVALUATIONS CONDUCTED

	Test Identification Number	Reported in Section	Page
Fuels:			
Diesel No. 2 Emissions Tests	6X1	V.D.3.	49
Diesel No. 1 Low Sulfur	622	V.D.3.	49
Low Sulfur Shalr Oil	623	V.D.3.	49
10%n-Butanol in No. 2	624	V.D.3.	49
Dual Fuel-Dual Injection	636	V.E.5.	63
Add Methanol at 64 km/h	6XS	V.D.3.&5.	52&68
Engine Modifications:			
Road Draft	625	V.D.4.	53
TRW Elastomer Rings	626	V.D.5.	54
2 Cylinder - 1700 IW	632	V.E.4.	61
Idle Shut-Off	633	V.E.3.	61
Dual Fuel-Dual Injection	636	V.E.5.	63
EGR and Water Injection	644	V.F.	69
Particulate Traps:			
Corning Catalyzed	627	V.D.6.	55
J-M Catalyzed	628	V.D.7.	58
Corning Noncatalyzed	613	V.C.3.	36
Texaco Catalyzed	616	V.C.4.	37
W.R. Grace Axial Non-Cat.	617	V.C.5.	40
W.R. Grace Radial Catalyzed	618	V.C.6.	40
W.R. Grace Radial Non-Cat.	619	V.C.7.	43

TABLE 9. PROPERTIES OF THE FUELS EVALUATED

		DF-1		DF-2		
Test	ASTM	EM-455	1979 Avg.	Baseline EM-408	Low S EM-459	1979 Avg.
Gravity, °API	D287	42.8	42.5	36.3	38.1	35.3
Viscosity, Cs	D445	1.64	1.68	2.80	2.79	2.80
Sulfur Content, wt %	D1266	0.06	0.07	0.28	0.00	0.26
Cetane Index	D976	51.1	50.9	50.0	54.0	49.2
Distillation Temp., °F						
IBP		324	351	373	362	381
10%		378	384	493	450	434
20%		430	426	506	504	507
End Point		516	525	635	585	643
FIA, %	D139					
Aromatics		15.4	--	32.7	25.8	--
Olefins		1.7	--	1.8	1.6	--
Saturates		82.9	--	65.5	72.6	--

2. Engine Modifications Evaluated

The evaluations involving modifications to the engine are briefly described as follows:

Road Draft - Disconnect the crankcase ventilation tube from the engine air inlet and vent the crankcase fumes to the atmosphere outside of the test cell.

TRW Elastomer Rings - Use of special piston rings which are designed to reduce oil consumption and blowby.

2 Cylinder-1700 IW - Disabling two cylinders of the four-cylinder VW engine and conducting the tests based on an inertia setting of 770 kg (1700 pounds) on the dynamometer.

Idle Shut-Off - Shutting off the engine as the engine speed approaches idle, and restarting the engine a couple of seconds prior to the next acceleration.

Dual Fuel-Dual Injection - Two separate independent injection systems, one for diesel fuel and the other for methanol.

EGR and Water Injection - A 1981 Mercedes 300SD equipped with exhaust gas recirculation and a system for the injection of water into the intake prior to the turbocharger.

3. Particulate Traps Evaluated

A total of seven particulate traps were evaluated. These are:

Corning Noncatalyzed - Corning EX-47 monolithic ceramic honeycomb substrate mounted in a container fabricated by Walker Manufacturing Company (Walker).

Corning Catalyzed - Corning EX-47 monolithic ceramic substrate, with a noble metal catalyst washcoat applied by Engelhard, mounted in a container fabricated by Walker.

JM-13 Catalyzed (Radial Flow) - Complete catalyzed particulate trap assembly obtained from Johnson Matthey. The trapping media consisted of a number of metal mesh disks.

Texaco Non-Catalyzed (Axial Flow) - Complete particulate trap assembly obtained from the Texaco Research Center, which consisted of coarse metal mesh with an alumina coating. Identified by Texaco as a diesel exhaust filter (DEF).

W.R. Grace Non-Catalyzed (Axial Flow) - A series of ceramic foam disks from W.R. Grace, mounted in a container fabricated by Walker.

W.R. Grace Catalyzed (Radial Flow) - A hollow cylinder of ceramic foam with a catalyst coating, obtained from W.R. Grace. This trap was mounted in a container fabricated by Walker.

W.R. Grace Non-catalyzed (Radial Flow) - A hollow cylinder of ceramic foam, from W.R. Grace, mounted in a container fabricated by Walker.

It should be noted that these devices are called traps by some and filters by others. In this report the term "trap" has been selected for use. Among other things, use of this term eliminates any possibility of confusion between the filtration used in particulate measurement and filtration used for particulate control.

C. Evaluations with the Mercedes 300SD - Car 61

The 1980 Mercedes 300SD, with a turbocharged diesel engine, was primarily utilized in the evaluations of particulate traps. One definite advantage of the use of the Mercedes for particulate trap evaluations was the ability to consistently attain the exhaust temperature necessary for trap regeneration. This temperature was attained using intake throttling at a speed only slightly above legal highway speed.

1. Summary of the Results

A total of five particulate traps were evaluated using the Mercedes (Car 61). These traps were obtained from Corning, Texaco and W.R. Grace (three different traps from W.R. Grace). Results of the evaluations conducted with the Mercedes are summarized in Table 10. The odometer reading on this car was approximately 4000 miles at Test Series 61TU, and was below 6000 miles at Test Series 6191. In this table, the average values of the after tune-up baseline results, along with the results of the baseline checks, were used in making the comparisons. Also, percent changes from baseline were calculated only for those changes which could be considered statistically significant. From these results it appears that:

- Three of the traps evaluated reduced particulate emissions by 75 to 80 percent of baseline values
- HC was significantly reduced by the catalyzed trap and by one non-catalyzed trap. No significant change in HC was apparent with the other noncatalyzed traps
- No significant change in CO occurred with any of these traps
- Some apparent increase in NO_x and fuel consumption occurred with the two traps producing relatively higher exhaust backpressures

TABLE 10. EMISSIONS RESULTS WITH THE MERCEDES 300SD - CAR 61

Test Series	Description	Emissions, g/km				Fuel ℓ/100 km	Initial Exh. Press. at 97 km/h, kPa[a]
		HC	CO	NO_x	Part.		
61TU	After Tune-Up	0.10	0.52	1.08	0.22	10.2	
Initial	Baseline Check	0.10	0.50	1.08	0.23	10.2	
Final	Baseline Check	0.11	0.63	1.01	0.26	10.1	
--	Overall Baseline Average	0.10	0.56	1.05	0.25	10.1	5
6131	Corning Non-Cat.	0.09	0.55	1.10[b]	0.05[b]	10.3[b]	10
6161	Texaxo Non-Cat.	0.04	0.57	1.14	0.06[b]	10.5	21
6171	W.R. Grace Axial Non-Cat.	0.09	0.54	1.20	0.06	10.4	43
6181	W.R. Grace Radial Cat.	0.07	0.62	1.08	0.14	9.9[b]	11
6191	W.R. Grace Radial Non-Cat.	0.11	0.58	1.07	0.13	10.3	10
--	1985 Standard	--	--	--	0.124	--	--
Change from Baseline Average,[c,d]							
6131	Corning Non-Cat.	--	--	--	-80%	--	+100%
6161	Texaco Non-Cat.	-60%	--	+	-75%	+	+300%
6171	W.R. Grace Axial Non-Cat.	--	--	+	-75%	+	+700%
6181	W.R. Grace Radial Cat.	-30%	--	--	-45%	--	+100%
6191	W.R. Grace Radial Non-Cat.	--	--	--	-50%	--	+100%

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[a] Initial exhaust backpressure value (1 kPa equal 4" H_2O)

[b] Relatively large variations in the test results

[c] -- indicates no significant change

[d] + indicates some apparent increase

The results of the evaluations with the Corning noncatalyzed trap are summarized in Table 11. With this trap, particulates were initially reduced about 75 percent, and the trapping efficiency appeared to increase with distance accumulation. In addition to the major reduction in particulates, the NO_x and fuel consumption results appeared to change with distance accumulation. These particulates, NO_x and fuel consumption results are summarized as follows:

Distance Accum., km	Exhaust B.P. at 97 km/h, kPa	NO_x, g/km	Particulate g/km	Particulate % Reduction	Fuel ℓ/100 km
Average B.L.	--	1.05	0.25	--	10.0
30	11	1.17	0.06	76	10.6
130	19	1.05	0.05	80	10.1
250	22	1.06	0.05	80	9.9
After Regen.	13	1.13	0.03	88	10.7

The NO_x and fuel consumption were highest initially, and after the trap was generated, and decreased as distance was accumulated.

For this regeneration, the intake manifold pressure was throttled to minus 13 kPa (-4 inches Hg) at 97 kilometers per hour (60 mph). The normal intake manifold pressure with the trap installed was plus 23 kPa; resulting in a total throttling of 36 kPa (11 inches Hg). The sequence followed was:

Sequence	Time Min.	Speed, km/h	E.B.P., kPa	Intake Man., kPa	Trap Temp., °C Before	Trap Temp., °C After
Warm-up	4	64	12	+7	---	---
Pre-Check	4	97	25	+23	357	353
Regeneration	8	97	10	-13	627	668*
Post-Check	4	97	14	+23	371	377
Subsequent Check	-	97	13	+23	---	---

---

* Maximum temperature in the initial regeneration

After the first few minutes of regeneration, the temperature before and after the trap had essentially reached stabilization. At that time, the temperature, after the trap, began to increase and the exhaust backpressure began to decrease. Near the end of the regeneration, the after-trap temperature began to decrease. This wan an indication that regeneration was complete, or that the rate of regeneration had decreased significantly.

TABLE 11. CORNING NONCATALYZED TRAP 1980 MERCEDES BENZ 300SD

Test (FTP or 60 mph)	Description	Exhaust B.P. at 97 km/h, kPa	Emissions, g/km HC	CO	NO_x	Part	Fuel, ℓ/100 km
Average	Baseline w/o trap[a]	5	0.10	0.56	1.05	0.25	10.1
--	10 km	11					
6131C1	30 km	13	0.10	0.56	1.17	0.06	10.6
6131C2	130 km	19	0.09	0.58	1.05	0.05	10.1
6131C3	250 km	22	0.09	0.49	1.06	0.05	9.9
--	320 km	25					
6131C4	After Regen.	13	ND	0.56	1.13	0.03	10.7
Average with trap		--	0.09	0.55	1.10	0.05	10.3
Trap/Baseline		--	--	--	+	20%	+
Reduction with Trap, %		--	--	--	--	80%	--
60 mph with trap		--	0.04	0.3	1.3	0.07	9.6
60 mph Regen.		--	0.03	4.5	0.8	0.09	11.9

---

[a] Value given is the average of the after tune-up baseline and baseline check evaluations

Due to the small number of tests conducted with each of these traps, the changes in NO_x and fuel consumption are not considered to be statistically significant. Based on the directional agreement between the test results, however, it appears that the traps producing the higher exhaust backpressures also caused some increases in NO_x and fuel consumption.

The exhaust backpressure produced by the W.R. Grace axial-flow trap, test series 6171, is considered to be unacceptably high. Backpressures with the other traps evaluated are considered potentially acceptable. The Corning trap produced large reductions in particulates with moderate increase in exhaust backpressure. The increases in backpressure with the W.R. Grace radial flow traps were also moderate, but particulate reduction obtained was considerably less (around fifty percent). This reduction in particulate was not sufficient to enable meeting the level of 0.124 g/km (0.2 g/mile) with this test vehicle. For vehicles with lower engine-out particulate levels, 50 percent efficiency may be adequate.

Regeneration, using intake throttling, was successful in three of the traps evaluated. Successful regeneration was not obtained with the two W.R. Grace radial-flow traps. This was due to the inability to obtain the relatively high temperature necessary for regeneration throughout the trap.

2. Baseline Evaluations and Baseline Checks

Baseline evaluations were conducted before and after tune-up at 6500 kilometers, and baseline checks were conducted periodically throughout the evaluations of the particulate control systems. The average values for the initial after tune-up baseline and for the baseline checks are summarized as follows:

Baseline[a]	Emissions, g/km				Fuel
	HC	CO	NO_x	Part.	ℓ/100 km
After 6500 km	0.11	0.51	1.02	0.215	9.8
After tune-up	0.10	0.52	1.08	0.223	10.2
6131	0.10	0.50	1.08	0.233	10.2
6171	0.10	0.60	1.04	0.276	10.0
6191	0.11	0.63	1.01	0.257	10.1
Average[b]	0.10	0.56	1.06	0.25	10.1

---

[a] Each baseline consists of one to three individual tests.
[b] Excludes the values for the initial baseline

As the testing progressed, there appeared to be some increase in CO and particulate and some decrease in NO_x. Over the entire duration of the evaluations of the particulate emission controls, these apparent changes were approximately plus 20 percent for CO, plus 15 percent for particulate, and minus 5 percent for NO_x. The HC emissions and fuel consumption were not sufficiently different or consistent to indicate any apparent changes as the testing progressed. Over the relatively long time span, there were some minor system and calibration changes, a change in drivers, and a change in the batch of fuel used. Also, a number of trap regenerations, using intake throttling, had been conducted on this car.

Upon reviewing the baseline data, it was decided to utilize the overall average baseline values in making comparisons in this report. Since relatively large reductions in particulates are required to meet the 1985 standard, the apparent baseline increase in particulates has an essentially negligible effect on the percent reduction for all viable particulate control systems.

3. Corning Noncatalyzed Trap

The Corning diesel particulate trap consisted of a round monolithic substrate, EX-47, 144 mm in diameter by 305 mm long (5.66 by 12.0 inches). This substrate had cells 2.54 millimeters square (200 square cells per square inch), with a wall thickness of 0.43 millimeters (17 mils). This trap substrate was procured from the Corning Glass Works. Fabrication of the container, and the initial mounting of the trap into the container, was performed by Walker Manufacturing Company.

The trap assembly was mounted under the right-front floorboard of the Mercedes 300SD. This was essentially the same location where the catalytic converter is mounted on a gasoline-fueled Mercedes. To facilitate attaining the temperature required for regeneration, the trap and the section of exhaust pipe from the manifold to the trap were insulated with ceramic fiber. Throttling was accomplished by mounting a throttle-plate in the adapter fitting between the turbocharger and the intake manifold. Exhaust backpressures (EPB), with and without the trap, are summarized as follows:

Speed		Exhaust Backpressure, kPa		
km/h	mph	Standard System	Container Only	Trap, Initial
64	40	2	3	5
80	50	3	5	7
97	60	5	7	11

The evaluation sequence involved duplicate emissions tests, followed by operation of the car over the FTP cycle until the exhaust backpressure reached 25 kPa (100 inches H_2O) at 97 km/h. At 25 kPa exhaust backpressure, which initially occurred after 330 km of operation, the trap was regenerated on the dynamometer using intake throttling, at a speed of 97 km/h.

An item of interest is that the weight gain on the 47 mm Pallflex back-up filters, during an FTP, was approximately the same with the trap as was previously obtained without the trap. Collection efficiency of the first filter decreased from about 97 percent without the trap to less than 90 percent with the trap. Therefore, it appears this trap effectively filtered out the particulate that was removed by the primary filter, but did not effectively remove the "particulate" that was collected on the back-up filter.

Large filter samples of particulate, collected with the trap installed, were extracted to determine the amount of organic solubles. These are compared with previous baseline values as follows:

		Composite Particulate Values[b]		
		Milligrams		Percent
Car	Test	Total	Extract	Extract
Mercedes	Baseline[a]	620	48	8
Mercedes	Corning Trap	107	22	20
Olds	Baseline	680	160	24
VW	Baseline	550	160	29

---

[a] Average of two tests

[b] Composite values determined using factors of 0.43 and 0.57 for the cold and the hot segments of the FTP

The total particulates were reduced about 80 percent with the Corning trap, but the organic extractables were only reduced by about 50 percent. As previously discussed in Section IV.B.4, the baseline percent extractables were considerably lower with the Mercedes than with the Oldsmobile and the Volkswagen.

4. Texaco Noncatalyzed Trap

The Texaco noncatalyzed trap, identified as a diesel exhaust filter (DEF) by Texaco, was initially scheduled to be evaluated on the Oldsmobile. The Mercedes, however, was subsequently selected for these initial screening evaluations on the basis of the ease of attaining conditions necessary for regeneration, and the difficulties that were encountered in regeneration attempts with the Oldsmobile. Trap sizing criteria are within ten percent on these two cars. The primary intent was to evaluate the trap; rather than the regeneration system. Length of the DEF is longer than the previously-evaluated traps, and exhaust system modifications were required for its installation. The filter bed volume of this trap was approximately seven liters.

Texaco provided information and several recommendations. Maximum recommended soot accumulation was stated to be 7 mg soot per gram of filter packing or 3.3 grams soot per liter of filter bed volume. The maximum recommended accumulation for the trap provided was about 23 grams. Regeneration temperature was stated to be 650°C (1200°F) at the inlet to the DEF. Regeneration was considered to be completed when the exit temperature of the DEF reached about 600°C (1100°F), with a minimum of 6 percent oxygen in the exhaust. Following regeneration, the exhaust flow rate should be maintained until the temperature of the DEF drops below 300°C (575°F).

The results with the Texaco trap are summarized in Table 12. As shown from the data in Table 12, this trap produced reductions in particulates and hydrocarbons of 75 and 60 percent, respectively. There were small apparent increases in NO_x and fuel consumption.

The distance accumulated prior to the initial regeneration was based on the maximum safe loading of 23 grams specified by Texaco. The loading of particulate on the trap was calculated, using the reductions in particulate and CH emissions as follows:

$$\text{Accumulation, km} = 23\ \text{g}/[(0.18 + 0.06)\ \text{g/km}] \simeq 100\ \text{km}$$

Using subsequent particulate emission values, the safe distance accumulation comes out to be somewhat lower. The two subsequent regenerations, however, were primarily based on having a specific increase in the exhaust backpressure, rather than on reaching the maximum allowable distance accumulation.

The regenerations were obtained by warming up the engine and then throttling the engine air intake, at a vehicle speed of 97 km/h (60 mph), to obtain over 600°C (1100°F) exhaust gas temperature at the trap inlet. Shortly after the inlet temperature reached 600°C, the rate of temperature rise of the outlet flow increased significantly, indicating burn-off was occurring. The outlet temperature generally continued to rise until it was equal to or exceeded the inlet temperature; then it began to decrease, indicating a decrease in the rate of burn-off. The oxygen level decreased during the actual regeneration and was generally between 4 and 5 percent when regeneration was completed.

Emissions measured during the regeneration are reported at the bottom of Table 12. During the regeneration cycle (relative to values without throttling), particulates, CO, and carbon balance fuel consumption increased, while HC remained essentially unchanged and NO_x decreased. The increases in emissions do not appear excessive when compared against the values for an FTP and the emission standards.

With the Texaco particulate trap, the initial and the after-regeneration backpressures of 21 and 25 kPa could be considered relatively high. The initial backpressure, the increase with distance accumulation, the regenerations, and the reductions in HC and particulates were discussed with a representative from Texaco. He concluded that the results of these evaluations appeared to be realistic.

TABLE 12. TEXACO NONCATALYZED TRAP 1980 MERCEDES BENZ 300SD

Test (FTP or 60 mph)	Description	Exhaust B.P. at 97 km/h, kPa[a]	Emissions, g/km HC	CO	NOx	Part.	Fuel ℓ/100 km
--	Baseline w/o trap	5	0.10	0.56	1.05	0.25	10.1
6161C1	26 km	21	0.04	0.57	1.13	0.072	10.65
6161C2	56 km	23	0.04	0.57	1.16	0.053	10.48
--	80 km	25	--	--	--	--	--
--	Regen., 103 km	--	--	--	--	--	--
6161C1	After Regen.	23	0.04	0.59	1.13	0.051	10.40
--	27 km	26					
--	42 km	29					
--	Regen., 63 km	--					
--	After Regen.	25					
--	24 km	26					
--	40 km	27					
--	55 km	28					
--	Regen., 68 km	--					
--	After Regen.	25					
Average with Trap		--	0.04	0.58	1.14	0.06[b]	10.5
Trap/Baseline		--	40%	--	+	25%	+
Reduction with Trap, %		--	60%	--	--	75%	--
60 mph with Trap[c]		--	0.02	0.35	1.56	0.032	10.1
60 mph Regen. 1[c]		--	0.02	1.29	0.92	0.062	11.3
60 mph Regen. 2[c]		--	0.01	1.51	0.88	0.064	11.7
60 mph Regen. 3[c]		--	0.02	1.78	0.95	0.068	11.9

---

[a] Factors for 64 and 80 km/h are 0.43 and 0.67

[b] Excluding initial test 6161C1, the average is 0.05

[c] Over total distance approximately equal to an UDDS

In summary, the Texaco trap reduced particulates to 0.05 g/km and HC to 0.04 g/km, and produced some increase in NO_x and fuel consumption. The trap was successfully regenerated several times. However, the recommended distance accumulation between regenerations was only about 100 kilometers, and the post-regeneration exhaust backpressure was about 24 kPa (100 inches of water). Emission rates during the regenerations were not considered to be excessive. Therefore, with the shortcomings mentioned, this trap was shown to produce large reductions in particulate and to be regenerable.

5. W.R. Grace Noncatalyzed Axial-Flow Trap

Ceramic foam trap material from W.R. Grace, about 150 mm diameter by 300 mm long, was installed into one of the existing trap containers by Walker Manufacturing Company. This particulate trap was installed onto the Mercedes (Car 61) and subjected to a series of evaluations. The emission results and the system backpressure are given in Table 13.

As shown from the data in Table 13, this trap produced a large reduction in particulates and some reduction in HC. The NO_x emissions were increased by about ten percent, and fuel consumption increased. Also, as shown, this trap produced relatively high exhaust backpressures of about 50 kPa (200" H_2O).

An interesting, but unexplainable, occurrence was the relationship between the HC and particulate emission rates measured at 97 km/h (60 mph). In the initial tests (S1 and R1), HC was lower and particulate was higher than in the repeat tests (S2 and R2). Of interest, however, is that HC plus particulate, for the same type test, remained essentially constant. The emissions during regeneration were not considered to be excessive.

Results obtained in these evaluations were discussed with a representative from W.R. Grace, and he concluded that they appeared to be realistic. The primary concern with this W.R. Grace axial-flow trap was the high exhaust backpressure.

6. W.R. Grace Catalyzed Radial Flow Trap

A W.R. Grace catalyzed radial flow trap, made of ceramic foam, was mounted into a container fabricated by Walker Manufacturing. The ceramic foam trap was approximately 110 mm OD and 50 mm ID by 200 mm long (4.5 inches OD and 1.9 inches ID by 8 inches L). It was designed for exhaust flow to enter through the outside wall and exit from the inside wall.

Results of the evaluations conducted are summarized in Table 14. These results show that the initial backpressure was a relatively moderate 11 kPa (44 inches of water) and that it increased at a moderate rate of approximately 2 kPa per 100 kilometers. This catalyzed trap reduced HC by 30 percent (having essentially the same effect on HC as did the previous

TABLE 13. W.R. GRACE NONCATALYZED AXIAL-FLOW TRAP 1980 MERCEDES BENZ 300SD

Test (FTP or 60 mph)	Description	Exhaust B.P. at 97 km/h, kPa[a]	Emissions, g/km				Fuel ℓ/100 km
			HC	CO	NO_x	Part.	
Average	Baseline w/o Trap	5	0.10	0.56	1.05	0.25	10.1
--	0 km[b]	43					
--	15 km	44					
6171C1	42 km	45	0.10	0.56	1.20	0.059	10.4
6171C2	76 km	46	0.07	0.52	1.19	0.058	10.3
--	103 km	48					
--	Regen., 140 km	--					
--	After Regen.[b]	45[b]					
--	24 km	46					
--	50 km	48					
--	106 km	51					
--	Regen., 164 km	--					
--	After Regen.	47[b]					
--	21 km	48					
6172C1	48 km	50	0.08	0.62	1.15	0.060	10.5
Average with Trap		--	0.08	0.57	1.18	0.06	10.4
Trap/Baseline		--	80%	--	110%	25%	+
Reduction with Trap, %		--	20%	--	--	75%	--
60 mph with Trap S1[c]		--	0.06	0.4	1.2	0.04	--
60 mph with Trap S2[c]		--	0.03	0.4	1.5	0.07	10.2
60 mph Regen. R1[c]		--	0.60	2.0	0.9	0.07	12.0
60 mph Regen. R2[c]		--	0.01	1.9	0.9	0.12	11.5

---

[a] Factors for 64 and 80 km/h are 0.43 and 0.67

[b] Value obtained from extrapolation to 0 miles

[c] Over total distance approximately equal to an UDDS

TABLE 14. W.R. GRACE CATALYZED RADIAL-FLOW TRAP 1980 MERCEDES BENZ 300SD

Test (FTP)	Description	Exhaust B.P. at 97 km/h, kPa[a]	Emissions, g/km HC	CO	NO_x	Part.	Fuel ℓ/100 km
--	Baseline w/o trap	5	0.10	0.56	1.05	0.25	10.1
--	0 km[b]	11[b]	0.07	0.62	1.08	0.148	10.0
6181C1	43 km	12	0.07	0.61	1.08	0.137	9.8
6181C2	72 km	13					
--	130 km	14					
--	172 km	15					
--	Regen. Attempt, 190 km[c]	--					
--	After Regen. Attempt	15					
--	Regen. Attempt, 220 km[d]	--					
--	After Regen. Attempt	14					
--	267 km	14					
--	348 km	17					
--	Regen. Attempt, 365 km[e]	--					
--	After Regen. Attempt	17					
Average with Trap		--	0.07	0.62	1.08	0.14	9.9
Trap/Baseline		--	70%	--	--	55%	--
Reduction with Trap		--	30%	--	--	45%	--

---

[a] Factors for 64 and 80 km/h are 0.43 and 0.67
[b] Value obtained from exprapolation to 0 miles
[c] Regeneration attempt using throttling only. Inlet at 580°C (1080°F) and outlet at 575°C (1070°F) and 3.5% oxygen
[d] Regeneration attempt using partial throttling and propane. Inlet at 570°C (1060°F) and outlet at 630°C (1170°F) and 3.0% oxygen
[e] Regeneration attempt using throttling only. Inlet at 590°C (1100°F) and outlet at 590°C (1100°F) and 3.5% oxygen

non-catalyzed axial-flow W.R. Grace trap), and had no significant effect on CO, NO_x or fuel consumption. Particulates were reduced approximately 45 percent.

The regeneration attempts had only a minimal effect on exhaust backpressure. The initial attempt was conducted in the same manner as used with the previous regenerations on the non-catalyzed traps. This method involved throttling the intake air to attain a trap inlet temperature of about 600°C (1100°F) with over three percent oxygen in the exhaust. The absence of a definite temperature rise in the exhaust during the attempted regeneration, along with lack of decrease in exhaust backpressure, indicated that regeneration did not occur.

Propane injection, along with slightly less throttling, was utilized in the second regeneration attempt. This regeneration appeared to be only slightly more effective than the first, with an apparent small reduction in exhaust backpressure.

Since the ends of this trap were not flat and perpendicular to the cylindrical axis, there was some concern that possibly leakage could have occurred to account for the results obtained. Therefore, the trap was disassembled and carefully examined. The clean appearance of all three gaskets involved in this assembly indicated that no leakage had occurred. The trap was reassembled, additional distance was accumulated, and regeneration was attempted. As with the previous attempts, however, this regeneration attempt was not successful.

Examination of the trap showed that some of the pores on the exterior surface, downstream of the inlet, were plugged. It appeared that stratification of the exhaust flow may have occurred in the trap; resulting in nonuniform loading of the particulate and/or nonuniform heating during regeneration. The trap was reassembled and reinstalled onto the car, and after and additional 120 kilometers, another regeneration was attempted. On the basis of exhaust backpressure, regeneration was not successful.

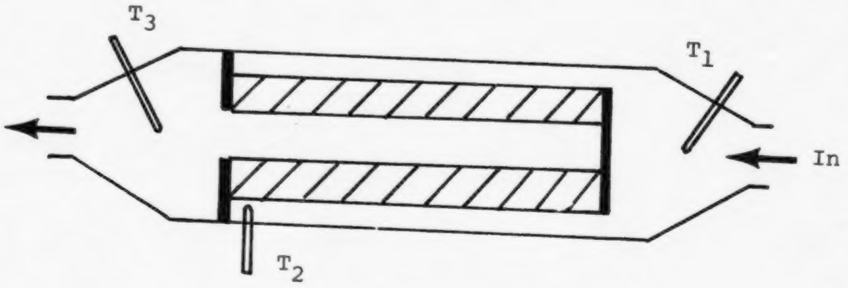
7. W.R. Grace Noncatalyzed Radial-Flow Trap

A W.R. Grace noncatalyzed particulate trap was mounted into one of the containers previously fabricated by Walker Manufacturing. This trap was then installed on the Mercedes (Car 61) and was subjected to a series of evaluations. In previous evaluations, a W.R. Grace radial-flow, catalyzed particulate trap did not regenerate in several attempts. These evaluations, with the noncatalyzed trap, were to determine whether or not a radial-flow, noncatalyzed particulate trap would regenerate, and if not, to attempt to determine the reason.

This particulate trap was the same size as the catalyzed trap described in the preceding section of this report, a hollow cylinder approximately 110 mm OD and 50 mm ID by 200 mm long. It was designed for the exhaust flow to enter at the outside diametrical surface and exit from the inside diametrical surface.

The results of the evaluations with this trap are summarized in Table 15. This trap reduced particulate by approximately 50 percent, and had essentially no effect on HC, CO, NO_x, or fuel consumption. Regeneration did not occur even though the inlet and exit temperatures were sufficiently high, based on previous regenerations with other traps. Maximum temperatures attained during regeneration attempts were 610°C (1130°F) inlet and 593°C (1100°F) outlet, with over three percent oxygen in the exhaust.

By installing a thermocouple downstream of the inlet of the trap at T_2, it was determined that a significant temperature stratification was occurring. The temperatures during a regeneration attempt were as follows:



Temperatures During Regeneration Attempt

	T_1	T_2	T_3
°C	610	488	593
°F	1130	910	1100

The temperature at T_2 was only 488°C (910°F), which is below the ignition temperature of the carbon particulate. Also, upon disassembly, the trap visually appeared to be more heavily loaded with particulate at the downstream end than at the upstream end.

It is possible that the following phenomena were occurring with this trap configuration:

- The larger particles tend to separate out of the flow and continue toward the downstream end of the trap. This results in heavier particulate loading at the downstream end of the trap.

- The flow rate through the downstream end of the trap is lower, and the wall quenching area is relatively large for those exhaust gases reaching the downstream end. This results in significant temperature reduction at downstream.

TABLE 15. W.R. GRACE NONCATALYZED RADIAL-FLOW TRAP 1980 MERCEDES BENZ 300SD

Test	Description	Exhaust B.P. at 97 km/h, kPa[a]	Emissions, g/km				Fuel ℓ/100 km
			HC	CO	NO_x	Part.	
--	Baseline w/o trap	5	0.10	0.56	1.05	0.25	10.1
--	11 km	10					
6191C1	40 km	13	0.12	0.59	1.10	0.14	10.4
6191C2	138 km	15	0.09	0.57	1.03	0.12	10.2
--	200 km	17					
--	Regen. Attempt	17					
--	Regen. Attempt	17					
Average with Trap		--	0.11	0.58	1.07	0.13	10.3
Trap/Baseline		--	--	--	--	50%	--
Reduction with Trap		--	--	--	--	50%	--

---

[a] Stabilized trap inlet temperature was about 315°C (600°F)

- In the regeneration attempt, the required regeneration temperature is attained only at the upstream end of the trap and within the interior cavity of the trap.

- Any regeneration that occurs at the upstream end of the trap has essentially no effect on the temperature at downstream.

The final evaluation conducted with this trap was to see if regeneration could be accomplished by reversing the flow through the trap. During this regeneration attempt, however, a longitudinal fracture occurred in the trap. This probably resulted from the combination of the pressure and thermal stresses that occurred within the trap under this condition.

In summary, this W.R. Grace trap had reasonably good particulate control with low initial backpressure. Some development is required with the overall system, however, to obtain uniform flow, uniform particulate loading, and uniform temperature distribution over the entire surface of the trap.

8. Summary of Trap Evaluations with the Mercedes

Three of the traps evaluated reduced particulate emissions by 75 percent or more. With one of the three, however, the increase in exhaust backpressure was considered to be excessive. Two versions of a fourth trap configuration had relatively low exhaust backpressure, but the reduction in particulate emissions was not sufficient to enable meeting the level of the 1985 particulate standard with this particular vehicle. None of the traps, catalyzed or noncatalyzed, had any noticeable effect on CO emissions, but two of the traps reduced hydrocarbons. High exhaust backpressure appeared to result in some effect on NO_x emissions and fuel consumption with the car tested.

The results are briefly summarized as follows:

Exhaust Configuration	Particulate, g/km	Initial Exhaust Backpressure at 97 km/h, kPa
Standard	0.124[a]	--
Baseline w/o Trap	0.25	5
Corning Non-Cat.	0.05	10
Texaco Non-Cat.	0.06	21
W.R. Grace Axial Non-Cat.	0.06	43
W.R. Grace Radial Non-Cat.	0.13	10
W.R. Grace Radial Cat.	0.14	11

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[a] Standard for 1985

Based on the results of these initial evaluations, it appeared that the Corning and the Texaco particulate traps were acceptable candidates for additional evaluations.

D. Evaluations with the Oldsmobile Delta 88 - Car 62

The 1980 Oldsmobile Delta 88, with a naturally-aspirated diesel engine, was utilized in evaluating a number of different fuels, engine modifications, and particulate traps.

1. Summary of the Results

Average results, for the primary evaluations conducted with the Oldsmobile, are given in Table 16. The odometer reading on this car was approximately 4000 miles at Test Series 62TU and below 6000 miles at the final Test Series. Significant reductions in particulates were obtained with two of the fuels evaluated and with the two particulate traps. In addition, decreased emissions of HC and CO were obtained with the No. 1 diesel fuel and the two catalyzed particulate traps evaluated. The other methods and systems evaluated, with one possible minor exception, did not have any apparent effect on emissions or fuel consumption. The 1985 particulate standard, 0.124 g/km, was met only with one of the particulate traps.

Difficulties were encountered in the attempts to regenerate the Corning catalyzed trap, and satisfactory regeneration of this trap was not achieved. With the Johnson Matthey JM-13 catalyzed trap, the temperature required to initiate regeneration, appeared to be somewhat lower than with any of the other particulate traps evaluated in this project.

2. Baseline Evaluations and Baseline Checks

Baseline evaluations were conducted before and after the tune-up at 6500 kilometers, and baseline checks were conducted before each group of control system evaluations. Average values for these baseline results are summarized on the following page.

Since large variations in HC occurred (0.27 to 0.43 g/km) in these baseline evaluations, and there were sufficient evaluations around each group of control methods, a separate baseline value has been calculated for each group of control methods. Baseline values, utilized in the tables for making comparisons with the control systems results, were calculated using an average of the baseline tests before and after (or in a couple of instances, nearest to the evaluation of) each group of control methods.

TABLE 16. EMISSIONS RESULTS WITH THE OLDSMOBILE DELTA 88 - Car 62

Test Series	Description	Emissions, g/km HC	Emissions, g/km CO	Emissions, g/km NO_x	Emissions, g/km Part	Fuel ℓ/100 km	Effect Produced[d]
62TU	After Tune-Up	0.32	0.74	0.75	0.28	11.5	
Initial	Baseline Check	0.30	0.79	0.77	0.30	11.2	
Final	Baseline Check	0.30	0.89	0.87	0.32	12.0	
Average	Overall Baseline Average	0.34	0.82	0.77	0.29	11.2	
Average	Fuels Baseline[a]	0.36	0.80	0.75	0.28	11.1	
62F2	No. 1 Diesel Fuel	0.21	0.66	0.80	0.23	11.2	Decreased HC, CO & Part.
62F3	Shale Oil DFM Low S.	0.40	0.81	0.75	0.23	11.1	Decreased Part.
62F4	10% 1-Butanol in No. 2 Diesel	0.41	0.89	0.74	0.25	11.3	Possible Decrease of Part.
Average	Road Draft Baseline[a]	0.40	0.83	0.76	0.28	11.1	
6251	Road Draft of Crankcase	0.39	0.79	0.81	0.29	11.1	No Apparent Effect
6252	Carbon Canister in Crankcase Vent	0.34	0.80	--	0.27	11.3	Decreased HC
Average	Vent Filter Baseline[a]	0.44	0.88	0.77	0.29	11.2	
6253	Crankcase Vent Filters Removed	0.43	0.89	0.76	0.30	11.5	No Apparent Effect
Average	TRW Rings Baseline[a]	0.36[b]	0.81[b]	0.74	0.27	11.3	
6261	TRW Elastomer Rings	0.40	0.82	0.71	0.28	11.4	No Apparent Effect
Average	Trap Baseline[c]	0.30	0.89	0.87	0.32	12.0	
6271	Corning Catalyzed Trap[c]	0.18	0.43	0.63	0.08	11.6	Decreased HC, CO, NO_x & Part.
Average	Trap Baseline[c]	0.30	0.89	0.87	0.32	12.0	
6281	Johnson Matthey Catalyzed Trap[c]	0.09[b]	0.27	0.78	0.14	11.7	Decreased HC, CO, NO_x & Part.

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[a] Average of baseline check runs before and after the fuels or system evaluations

[b] There were variations in the individual values

[c] Without EGR (EGR was disconnected to enable installation of a throttle in the intake)

[d] Less than ten percent change in emissions described as "No Apparent Effect"

Baseline[a]	Emissions, g/km HC	CO	NO_x	Part.	Fuel ℓ/100 km
After 6500 km	0.39	0.87	0.75	0.32	12.2
After Tune-Up	0.32	0.74	0.75	0.28	11.5
Fuels[b]	0.34	0.79	0.77	0.03	11.2
Road Draft[b]	0.39	0.81	0.74	0.27	11.0
TRW Rings[b]	0.43	0.86	0.77	0.29	11.3
After TRW Rings	0.27	0.74	0.72	0.26	11.4
Traps[c]	0.30	0.89	0.87	0.32	12.0
Durability[d]	0.25	0.78	0.87	0.31	11.7

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[a] Each baseline consists of one to three individual tests.
[b] Conducted before evaluation of the designated control method or system
[c] EGR disabled to enable installation of a throttle in the air intake prior to this test.
[d] Throttle removed and the EGR reconnected prior to this test.

In order to incorporate intake throttling on the engine for the particulate evaluations, it was advantageous to disable the EGR system. This appeared to result in some increase in NO_x and in particulates. However, after the throttle was removed and the EGR was reconnected, the NO_x and particulates did not decrease. Therefore, baseline NO_x values had apparently changed, or the EGR system was not functioning properly. Due to the higher exhaust backpressure with the trap installed, higher EGR rates will occur and should be taken into consideration if EGR is used with particulate traps. Such higher rates of EGR could affect gaseous and particulate emission rates and fuel consumption.

3. Fuels Evaluated

Three fuels were evaluated in the Oldsmobile, in addition to the baseline No. 2 diesel fuels. An additional evaluation involved blending of methanol into the baseline diesel fuel. The fuels evaluated include:

- No. 2 Diesel Fuel used for Baseline Evaluations (EM-408)
- No. 1 Diesel Fuel (EM-455)
- Low Sulfur No. 2 type fuel made from shale oil (EM-459)
- No. 2 Diesel Fuel plus 10 percent 1 -Butanol (EM-456)

Chemical and physical properties of these fuels are given in Table 17. With the exception of a lower initial boiling point and a lower flash point, the No. 1 diesel fuel evaluated had properties very similar to the national average. The low sulfur No. 2 type fuel had no measurable sulfur and a relatively high cetane index. The other properties of this fuel were generally between those for a No. 2 and a No. 1 diesel fuel.

TABLE 17. PROPERTIES OF THE DIESEL TEST FUELS

		No. 1 Fuel		No. 2 Fuel		
Test	ASTM	EM-455[a]	1979 Avg.[b]	Baseline EM-408[c]	Low S EM-459[d]	1979 Avg.[b]
Gracity, °API	D287	42.8	42.5	36.3	38.1	35.3
Specific Gravity		0.812		0.843	0.834	
Viscosity, cS	D455	1.64	1.68	2.80	2.79	2.80
Sulfur Content, wt %	D1266	0.06	0.07	0.28	0.00	0.26
Cetane Index	D976	51.1	50.9	50.0	54.0	49.2
Distillation Temp., °F						
Vol. Recovered	D86	99.1	--	97.5	99.3	--
IBP		324	351[e]	373	362	381
10%		378	378	493	450	434
50%		430	426	506	504	507
90%		482	481	602	560	593
End Point		516	525	635	585	643
FIA, %	D1319					
Aromatics		15.4	--	32.7	25.8	--
Olefins		1.7	--	1.8	1.6	--
Saturates		82.9	--	65.5	72.6	--
Flash Point, °F	D93	120	138[f]	178	178	167

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[a] Gulf No. 1 Commercial Diesel Fuel

[b] Diesel Fuel Oils, 1979, BETC/PPS-79/5, 12/79

[c] No. 2 Emissions Test Fuel blended by Howell Refinery

[d] No. 2 Low Sulfur DFM from Shale Oil Crude Stock D.F.S.C. No. 79-7299-5

[e] Minimum was 300°F

[f] Minimum was 120°F

Results of the evaluations with these fuels are summarized in Table 18.

TABLE 18. RESULTS WITH VARIOUS FUELS IN THE OLDSMOBILE DELTA 88

	EM-408 BL Check, F1-3&4	EM-455 DF-1 Low S. F2C2&3	EM-459 Low S. Shale Oil F3C2&3	EM-456 408 + 10% 1-Butanol F4C1&2	EM-408 BL Check, F1-5&6
HC, g/km	0.34	0.21	0.40[a]	0.41	0.39
CO, g/km	0.79	0.66	0.81	0.89	0.81
NO_x, g/km	0.77	0.80	0.75	0.74	0.74
Part., g/km	0.30	0.23[a]	0.23	0.25	0.27
Fuel, ℓ/100 km	11.2	11.2	11.1	11.3	11.0

EM-408 - No. 2 Emissions Test Fuel blended by Howell Refinery

EM-455 - Gulf No. 1 Commercial Diesel Fuel

EM-456 - 10% 1-Butanol in EM-408

EM-459 - No. 2 Low Sulfur DFM from Shale Oil Crude Stock

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[a] Difference between the runs was greater than 10%

Relative to the baseline check evaluations, all three of the other fuels appeared to produce somewhat lower particulate emissions; reductions were as much as 20 percent with the No. 1 and the zero-sulfur fuels. Also, with the No. 1 fuel, HC and CO emissions decreased, and NO_x increased. With the fuel containing 10 percent 1-butanol, CO emissions and (apparently) fuel consumption increased. The volumetric heating value of this fuel blend is 98 percent of that for the No. 2 diesel fuel. Therefore, fuel consumption would be expected to increase by about two percent with this blended fuel. A change of two percent, however, cannot be determined with statistical significance using only duplicate evaluations.

Operating difficulties occurred with the Oldsmobile at the start of evaluations with the No. 1 diesel fuel. The results of the initial evaluations with the No. 1 fuel were significantly different from what was expected. Therefore, tests were conducted with the No. 2 diesel and these results were significantly different from the initial baseline results. The results of these evaluations, along with the initial baseline results, are briefly summarized on the following page.

	No. 2 Diesel Fuel			
	Baseline Results		Baseline	No. 1
	BL	TU	Check	Fuel
HC, g/km	0.39	0.32	0.17	0.11
CO, g/km	0.87	0.74	0.64	0.61
NO_x, g/km	0.75	0.75	1.07	1.08
Part., g/km	0.32	0.28	0.32	0.36

It was noted that the engine ran roughly during cold-start idle operation. After checking the EGR system and the fuel supply system the car was returned to the dealer for repair. The service department verified that the engine was not idling properly, and examined the systems which could cuase this problem. This servicing included checking the injectors. The problem cleared up without their finding any specific cause. Subsequent tests with the No. 2 fuel produced results which were in good agreement with the initial baseline results. Results given in Table 18 are from evaluations conducted after this problem cleared up.

Diesel-Methanol Blend - Methanol was added into the fuel system of the Oldsmobile just prior to the injection pump. The diesel-methanol mixture then passed through the transfer pump, which should assure reasonably good blending of these nonmiscible liquids. With the car operating at a steady 72 kilometers per hour (45 mph), methanol was added until engine operating was noticeably changed. Such change was based primarily on engine roughness. The methanol flow rate was then decreased until smooth engine operation was reattained. This process was repeated several times to assure that the engine roughness repeatedly occurred at the same methanol flow rate. This rate was then defined at the "maximum amount" of methanol that can be added without readily apparent engine roughness. Optimization of engine parameters, such as injection timing, was not conducted.

The emissions results without and with methanol, from ten minutes of steady state operation, were as follows:

		Values at 74 km/hr (45 mph)						
		Emissions, g/km				Fuel Consump., ℓ/100 km		
Fuel	Test	HC	CO	NO_x	Part.	Diesel	Meth.	Diesel %
Diesel	Avg.	0.06	0.29	0.79	0.096	7.22	0	100
Die. +Meth.	Avg.	0.11[a]	0.36	0.58	0.044	5.00	4.93	69[b]
Diesel	62SS-1	0.06	0.28	0.73	0.099	7.25	0	100
Diesel	62SS-2	0.05	0.29	0.84	0.092	7.18	0	100
Die.+Meth.	62SSC1	0.11[a]	0.34	0.54	0.043	5.03	4.95	69[b]
Die.+Meth.	62SSC2	0.11[a]	0.37	0.62	0.044	4.98	4.90	69[b]

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[a] Based on exhaust HC made up ot 86.6% and 13.4% H, by weight

[b] Relative to runs with diesel fuel only

The addition of the methanol increased hydrocarbons and decreased oxides of nitrogen and particulates. The mixture supplied to the injection pump was essentially half methanol and half diesel fuel. This mixture resulted in a thirty percent decrease in the amount of diesel fuel consumed, based on the measured fuel input ratio and fuel consumption calculated by carbon balance.

The next investigation was to determine the "maximum amount" of methanol with the glow plugs left on continually. The glow plugs were found to clear up minor roughness obtained with a five to ten percent increase in methanol, over the previously discussed "maximum amount". Emissions were not measured during this investigation.

4. Road Draft Evaluations

These evaluations involved modifications to the crankcase ventilation system. In the standard configuration, the crankcase fumes are vented into the intake of the engine. Modifications evaluated included: venting into the atmosphere, flowing through a carbon canister, and removal of the crankcase ventilation filters from the system. These modifications are described as follows:

Road Draft - The crankcase was vented into the atmosphere outside of the test area, rather than into the intake of the engine.

Carbon Canister - A container filled with activated carbon was installed into the vent tubing between the crankcase and the engine intake. The portion of the container filled with 6 to 14 mesh activated coconut charcoal was approximately 65 mm in diameter by 100 mm long.

Vent Filters Removed - Removal of the oil separating filters that are located in the crankcase ventilation system above the valve cover.

The crankcase vent system design on the Oldsmobile is such that the vacuum in the intake, although slight, could possibly draw fresh air into the crankcase under some conditions. With the road draft configuration, the crankcase always remains under slight pressure and no fresh air can enter. Results of these evaluations are summarized in Table 19.

Except for the apparent small decrease in HC with the carbon canister and the apparent small increase in the HC with the vent filters removed, changes in emissions and fuel consumption were generally within normally experienced repeatability.

TABLE 19. RESULTS WITH ROAD DRAFT AND CARBON CANISTER IN CAR 62
1980 Oldsmobile Delta 88
EM-408 No. 2 Diesel Fuel

	BL Check, F1-5&6	Road Draft 51C1&2	Carbon Canister 52C1	BL Check 52-1	Crankcase Vent Filters Removed
HC, g/km	0.39	0.39	0.34	0.40	0.43
CO, g/km	0.81	0.79	0.80	0.81	0.78
NO_x, g/km	0.74	0.81	ND[a]	0.76	0.78
Part., g/km	0.27	0.29	0.27	0.28	0.29
Fuel, ℓ/100 km	11.0	11.1	11.3	11.3	11.2

Road Draft - Crankcase blowby exhausted out of test cell

Carbon Canister - Crankcase ventilation passed through activated carbon

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[a] NO_x value was questionably low at 0.68 g/km

Since it is possible for significant changes in organic extractables to occur, even with the negligible changes in total particulates, large filter samples were extracted. The results, along with previous baseline results, are summarized as follows:

Test	UDDS Cycle	Filter No.	Particulates, mg Total	Particulates, mg Extract	% Extract
Road Draft 6252C1	Cold	-17	842	172	20.4
	Hot	-18	652	157	24.0
	Composite		734	163	22.2
Baseline 62TU-1	Composite		683	160	23.5

As shown, there was no significant difference in percent or organic extractables with the baseline and the road draft configurations.

5. TRW Elastomer Rings

The standard piston rings were removed from the Oldsmobile engine and were replaced with piston rings obtained from the Ramsey Corporation, a subsidiary of TRW, Incorporated. Installation required reworking the ring groove for the lower compression ring. Tests were run after about 130 kilometers of break-in, a distance considered to be more than adequate by a representative of TRW.

The results of the evaluations with the TRW elastomer rings are summarized as follows:

Test Series	Description	Emissions, g/km HC	CO	NO_x	Part.	Fuel, ℓ/100 km
Average	Associated Baseline	0.36[a]	0.81[a]	0.74	0.27	11.3
6261CX	TRW Rings	0.40	0.82	0.71	0.28	11.4

---

[a] There were relatively large variations in the individual values

As shown, there were no readily noticeable changes in emissions with the TRW elastomer rings.

The primary purpose of these rings is reported to be the elimination, or at least minimization, of blowby. Therefore, the effects could be expected to be virtually equivalent to those obtained in the road draft evaluations, where the crankcase blowby was exhausted into the atmosphere rather than into the intake manifold. These results are summarized as follows:

Test Description	Emissions, g/km HC	CO	NO_x	Part.	Fuel ℓ/100 km
TRW Elastomer Rings	0.40	0.82	0.71	0.28	11.4
Road Draft	0.39	0.79	0.77	0.29	11.3

The values for the TRW rings and the road draft evaluations were virtually the same for all emissions, with the possible exception of NO_x.

6. Corning Catalyzed Trap

A catalytic coating was applied to a Corning EX-47 (5.66 inches x 12.0 inches) substrate by Engelhard Industries (Order No. 80-099-05115, Unit H-025504). This unit was installed into one of the containers fabricated by Walker Manufacturing. The results of evaluations conducted with this unit are summarized in Table 20.

Some differences were apparent in the trap baseline results relative to the initial baseline. At the time, it was assumed that the disabling of the EGR was associated with the increase in NO_x and CO in the trap baseline

TABLE 20. CORNING CATALYZED TRAP 1980 OLDSMOBILE DELTA 88

Test	Description	Exhaust B.P. at 97 km/h, kPa[a]	Emissions, g/km HC	CO	NO_x	Part	SO_4	Fuel ℓ/100 km
62BL-X	Initial Baseline	--	0.39	0.87	0.75	0.32	--	12.2
62TU-X	After Tune-Up B.L.	--	0.32	0.74	0.75	0.28	--	11.5
--	Trap Baseline[b]	9	0.30	0.89	0.87[b]	0.32	--	12.0
6271C1	42 km	15	0.21	0.56	0.63	0.07	0.003	11.5
6271C2	71 km	16	0.19	0.43	0.64	0.09	--	11.7
6271C3	124 km	20	0.14	0.29	0.60	0.08	0.006	11.7
--	154 km	22						
Regeneration Attempt		28						
Partial Regeneration		23						
Average with Trap		--	0.18	0.43	0.62	0.08	0.005	11.6
Reduction with Trap		--	40%	50%	>15%	75%	--	--

---

[a] Factors for 64 and 80 km/h are 0.57 and 0.75
[b] EGR disabled

tests. Subsequent evaluations, however, indicated that a baseline shift had possibly occurred at some point. The basic conclusions, however, are not affected by any such baseline shift within the range of the baseline values obtained.

As the testing of the trap progressed, HC and CO emissions decreased; whereas NO_x, particulates, and fuel consumption remained essentially constant. With the trap installed, relative to baseline values, NO_x decreased slightly and particulates decreased by greater than 75 percent.

Sulfate emissions, with the trap, were approximately three milligrams per kilometer. It should be noted, however, that all exterior surfaces of the core were coated with the precious metal catalyst. Therefore, it is conceivable that sulfate could form on the inlet side of the trap and be retained by the trap.

This catalyzed Corning particulate trap was loaded up to an exhaust backpressure of approximately 25 kPa (100 inches of water), and a regeneration was attempted. In previous conversations with various EPA and industry personnel, the impression received was that the temperature required to initiate regeneration would be lower with a catalyzed trap than with a non-catalyzed trap. This influenced the approach taken toward regeneration.

Initially, without the trap installed, the intake to the engine was throttled and the exhaust was visually observed. The exhaust was not readily visible at 34 kPa of intake manifold vacuum and became visible at 37 kPa. Therefore, 34 kPa was taken to be the probable useful limit for regeneration. At 34 kPa the maximum temperature attained was 455°C (850°F) and light-off of the trapped particulate did not occur. A short excursion to 40 kPa produced a maximum temperature near 540°C (1000°F), again without light-off. The trap and catalyst manufacturers (Corning and Engelhard) were contacted to discuss regeneration. In each case, they accepted the apparent finding that catalyzing did not significantly lower the temperature required to initiate regeneration.

In a second regeneration attempt, propane was added into the exhaust, through a multi-hole probe, prior to the catalyzed trap. To maintain some consistency with the method previously used to regenerate the non-catalyzed trap in the Mercedes, throttling to 30 kPa at 96 km/h was used along with the addition of propane. Carbon monoxide was measured continuously during this regeneration attempt. With the 30 kPa of throttling, the temperature after the trap reached approximately 425°C. As propane was added, the trap temperature increased until light-off of the trapped particulates occurred at approximately 600°C. At this point (temperature stability had not been reached when light-off occurred), and CO increased over an order of magnitude and the temperature rapidly increased to greater than 800°C. The propane was shut-off and the temperature began to decrease. A subsequent check at 96 km/h showed that the exhaust backpressure has decreased from a pre-regeneration value of about 28 kPa down to 22 kPa.

Since complete regeneration of the trap had apparently not been achieved, the process was repeated. The temperature was increased to over 660°C without achieving additional noticeable oxidation of the particulates. The trap assembly was then removed and visually examined. The trap substrate was uniformly dark gray on the entrance end and was uniformly light gray on the exit end. Other than the dark coloration on the inlet end, there was no build-up of particulates apparent.

7. Johnson Matthey Catalyzed Trap

A Johnson Matthey JM-13 catalyzed trap was evaluated on the 1980 Oldsmobile. This trap was received as a complete assembly from the supplier. Application of this trap required only the installation of appropriate connector flanges into the inlet and outlet of the trap.

The emissions and backpressure results, with the Johnson Matthey trap, are summarized in Table 21. This trap produced average reductions of 55 percent for particulates and 70 percent for HC and CO. This trap did not appear to have very significant effects on NO_x and fuel consumption. The exhaust backpressure and the change in backpressure with distance accumulation were relatively low.

Regeneration was initiated at a trap inlet temperature as low as 400°C (750°F). The method used for these regenerations, however, was to run the engine at full governed speed in neutral for 90 seconds. Based on the exhaust backpressures after the regeneration, however, it appeard that complete regeneration may not have been achieved. This trap, however, did not reduce the particulate sufficiently for the vehicle to achieve the 0.124 g/km (0.2 g/mi) level required by the standard for 1985. A representative of Johnson Matthey stated that the 1980 Oldsmobile they had tested had lower baseline emissions than the one we were using in this program. Even so, however, he said that this trap should have reduced the particulate emissions to values significantly below the standard. He indicated that this unit appeared to be somewhat defective, and he agreed to provide a replacement unit.

In summary, this Johnson Matthey catalyzed trap produced relatively large reductions of HC and CO and moderate reduction of particulates. Exhaust backpressure produced by this trap was relatively low. In the evaluations conducted, however, particulates were not reduced sufficiently to meet the 0.124 g/km level.

E. Evaluations with the Volkswagen Rabbit - Car 63

The 1980 Volkswagen Rabbit, with a naturally-aspirated diesel engine, was primarily used to evaluate engine and fuel system modifications. These modifications included: shutting off the engine at idle, a two-cylinder with 737 kg (1625 lb) inertia weight configuration, and a fuel dual-dual injection system. An additional evaluation involved the blending of methanol into the baseline diesel fuel.

TABLE 21. JOHNSON MATTHEY CATALYZED TRAP 1980 OLDSMOBILE DELTA 88

Test	Description	Exhaust B.P. at 97 km/h, kPa[a]	Emissions, g/km				Fuel ℓ/100 km
			HC	CO	NO_x	Part	
62BL-X	Initial Baseline	--	0.39	0.87	0.75	0.32	12.2
62TU-X	After Tune-Up B.L.	--	0.32	0.74	0.75	0.28	11.5
6281-2	Trap Baseline[b]	9	0.30	0.89	0.87[b]	0.32	12.0
--	18 km	12					
6281CL	40 km	13	0.11	0.23	0.75	0.14	11.8
--	97 km	13					
6281C2	125 km	13	0.13	0.34	0.77	0.14	11.6
--	193 km	13					
--	342 km	15					
--	90 sec at Gov.[c]	15					
--	WOT Accel.[d]	13[e]					
Reinsulation of Exhaust System							
--	478 km	15					
--	90 sec. at Gov.[c]	14[e]					
6282C3	507 km	14	0.03	0.24	0.81	0.13	11.7
Average with Trap		--	0.09	0.27	0.78	0.14	11.7
Reduction with Trap		--	70%	70%	--	55%	--

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[a] Factors for 64 and 80 km/h are 0.52 and 0.73. Stabilized trap inlet temperature was about 225°C (490°F)

[b] EGR system was disabled

[c] With the system hot, and the transmission in neutral, the accelerator was pushed to the floor and held for 90 seconds

[d] With the system hot, a high-load WOT acceleration in each gear was performed

[e] Maximum inlet temperature was approximately 400°C (750°F)

1. Summary of the Results

Of the control configurations evaluated with the Volkswagen Rabbit, only the dual fuel-dual injection system produced significant reduction in particulates.

Shutting-off the engine at idle reduced particulate emissions and fuel consumption by approximately five percent. The two-cylinder 740 kg inertia weight configuration, as evaluated, resulted in higher particulates and fuel consumption. With the dual-injection system, using methanol to replace seventy percent of the baseline consumption of diesel fuel (in ℓ/100 km), particulate and NO_x emissions were reduced by approximately fifty percent. However, HC and CO emissions increased several hundred percent, and fuel consumption, on the basis of heat content, increased by more than ten percent.

2. Baseline Evaluations and Baseline Checks

Baseline evaluations were conducted before and after the tune-up at 6500 kilometers (4000 miles), and baseline checks were conducted periodically throughout the evaluations of the particulate control systems. The odometer reading was below 6000 miles at the conclusion of these evaluations. These baseline evaluations are summarized as follows:

	Emissions, g/km				Fuel
Baseline[a]	HC	CO	NO_x	Part	ℓ/100 km
After 6500 km	0.15	0.58	0.74	0.22	6.5
After Tune-up	0.17	0.54	0.74	0.22	6.5
63TU-4	0.20	0.55	0.81	0.24	6.3
Idle Shut-off	0.17	0.56	0.80	0.23	6.0
Two-Cylinder	0.15	0.55	0.74	0.21	6.1
Average[b]	0.17	0.55	0.76	0.22	6.2

---

[a] Each baseline consisted of one to three individual tests

[b] Excludes the values for the initial baseline after 6500 kilometers

A fourth test (63TU-4) was run, after tune-up, due to a significant decrease in fuel consumption in the third test. The fuel consumption in the fourth test was in agreement with that in the third test. Fuel consumption in subsequent tests decreased by an additional amount. Therefore, it appears that a baseline shift of about six percent in fuel consumption did occur.

3. Engine Shut-Off at Idle

This evaluation involved shutting-off the engine as the engine speed approached idle, during the FTP evaluations, and restarting the engine about two seconds prior to the next acceleration. For this evaluation, the shutting-off and restarting was performed manually by the driver. Results of this evaluation are summarized in Table 22. As illustrated by the data in Table 22, the measured particulate and fuel consumption decreases appear to be in agreement with projections based on time in mode at about five percent. With HC and CO there was no apparent change, whereas the projection was an eight percent decrease. NO_x appeared to decrease by more than ten percent, whereas the projection was a six percent decrease. It should be noted that two tests do not constitute a statistically significant sample. Even so, however, it appears applicable to conclude that reduction in particulates, with idle shut-off, was relatively small.

TABLE 22. RESULTS OF IDLE SHUT-OFF WITH VW RABBIT

	Idle Shut-Off[a]	Baseline[b]	Change, %	
			Measured	Projected
HC, g/km	0.17	0.17	N.A.C.[c]	-8
CO, g/km	0.56	0.56	N.A.C.	-8
NO_x g/km	0.68	0.80[d]	-14	-6
Part., g/km	0.22	0.23	-4	-5
Fuel, ℓ/100 km	5.7	6.0	-5	-5

---

[a] Average of two repeatable evaluations
[b] Projection based on modal data from Final Report EPA-460/3-79-008
[c] N.A.C. designated No Apparent Change
[d] NO_x in the baseline checks was 8 percent higher than in the averages of the before and after tune-up baseline at 6500 kilometers

4. Two-Cylinder with Reduced Inertia Weight

The engine in the VW Rabbit was converted to a configuration having only two operable cylinders. This was accomplished by removing the injectors and deactivating the valves on two of the cylinders. The two injectors were removed from the cylinders and were replaced with dummy injectors. The injectors removed were allowed to inject into pieces of tubing from which the injected fuel ran into a collection can. The valves on two of the cylinders were deactivated by grinding the corresponding lobes off the camshaft. The pistons in the two deactivated cylinders were not removed or modified.

Firing order on the engine was 1-3-4-2, and cylniders 2 and 3 were deactivated. This resulted in having one power stroke for each revolution of the engine. The pistons were left in the deactivated cylinders to maintain dynamic balance. It should be noted, however, that this results in retaining mechanical friction from the pistons operating in the two non-firing cylinders.

Choices of inertia settings around 771 kg (1700 lbs) were 737 and 794 kg. The 737 inertia was selected due to the difficulty experienced in following the driving cycle with this two-cylinder configuration. Using several assumptions, it was estimated that operating this engine on two cylinders with 737 kg inertia is about the equivalent of operating the engine on four cylinders with 1814 kg (4000 lbs) inertia. With the additional friction of the two non-power producing pistons, the equivalency would probably still be greater than 1633 kg (3600 lbs) inertia.

The dynamometer power setting used was 3.7 kW (4.9 hp). This was based on a ratio of 0.0048 kW per kg of inertia (0.0029 hp per pound), a value found applicable to the VW and the Oldsmobile cars used in this project.

By remaining in each gear until the maximum safe engine speed was reached, the FTP driving trace could essentially be followed, except for the one high speed acceleration to 90 km/h. This, however, required operating the engine at greatly different speeds than were required in the baseline configuration. The shift points used were as follows:

Shift Out of Gear	Car Speed, km/h 4-cyl.	2-cyl.
1	15	24
2	25	44
3	40	N.A.[a]
4	Final Gear	--

---

[a] Could not accelerate in 4th gear

The results of the two-cylinder evaluations were as follows:

Configuration	Emissions, g/km HC	CO	NO_x	Part.	Fuel ℓ/100 km	Dist. at 505 sec. km
Baseline Avg.	0.15	0.54	0.74	0.22	6.0	5.7
Two Cyl. Avg.	0.27	0.91	0.81	0.28	7.3	5.4[a]
Two Cyl. Malf.[b]	0.38	1.11	0.92	0.42	8.5	5.4[a]

---

[a] Deviation from the baseline value was due to the inability to follow driving trace above 50 mph

[b] Test voided due to dynamometer brake malfunction. Test has been reported to show effect of the increased load on emissions and fuel consumption

The two-cylinder configuration resulted in increases in all emissions and fuel consumption. This increase in probably related, at least in part, to this significant amount of time at which the engine had to be operated at maximum speed and load when in the two-cylinder configuration. As previously stated, the overall relationship of this system was estimated to be equivalent to a 1814 kg (4000 lb) inertia car with a four-cylinder engine.

In converting a four-cylinder engine to a lesser number of operating cylinders, there are several factors that should be taken into consideration:

- There are two ways to simulate a two-cylinder engine with a four-cylinder engine when the firing order is 1-3-4-2

  Method 1 - Fire cylinders 1 and 4, or 3 and 2

  Method 2 - Fire cylinders 1 and 3, 3 and 4, 4 and 2, or 2 and 1

  In either case, there is at least one compression stroke occurring without an associated power stroke. One of the methods could require balance weights (and possibly a larger flywheel) and the other could require a significantly larger flywheel. The power losses in the water pump, injection pump, and drive system, and the losses due to the weight of the vehicle on the dynamometer, will remain essentially constant. Therefore, a two-cylinder modification will not necessarily be fully representative of a well designed two-cylinder automobile.

- Dynamometer horsepower setting is primarily a function of vehicle frontal area. Horsepower setting should either be based on the selected frontal area or on the horsepower requirements with existing minicars.

- If the performance of the simulated car is to be equivalent to that of the 1981 VW Rabbit, the inertia weight setting will probably have to be 1000 pounds or less (0.5 x 90/70 x 2375 x 0.9).

- Performance characteristics could also be modified by changes in transmission or axle ratios.

5. Dual Fuel-Dual Injection

This system consisted of the standard Bosch diesel injection system, and an auxiliary injection system for methanol. For this auxiliary system, the methanol injectors were mounted in the glow plug holes. A Lucas CAV Minimec, four-plunger in-line pump (Model P5178/4E) was used as the methanol pump. This pump is used in England on Ford York light-duty swirl chamber engines and has an injection advance curve almost identical to that of the stock Bosch diesel pump. The injection rate (over 2.5 times that of the Bosch pump) and the duration of this Lucas pump was consistent with the expected requirements for using methanol in a swirl chamber engine.

This Lucas pump had a separate oil gallery for lubrication of all moving parts, except for the plunger. With the concurrence of Lucas, straight methanol (without any added lubricants) was used. No problems occurred with this injection pump due to operating on straight methanol.

Selection of methanol injectors was primarily controlled by the constraints of the space available. Stanadyne (Roosa Master) external-opening poppet valve injectors with a 90° fuel inlet were selected. These nozzles were designed by Stanadyne for use in swirl chamber engines. Pressure transducers were installed in the diesel and methanol injection lines to assist in tuning of the system. Photographs of the nozzles installed in the cylinder head and of the entire system installed in the car are shown in Figure 2.

In the dual fuel mode, the diesel pump is set at the rate required for a slightly higher than specified idle speed. Only a minimal quantity of methanol is injected at idle. The throttle is connected to the methanol pump, so vehicle operation is controlled by the rate of methanol injection. The rate of diesel fuel injected per stroke is reduced somewhat by the Bosch pump governor as the engine speed increases.

For good acceleration from low engine speeds, an idle fuel setting resulting in 1000 to 1100 rpm was required. For all other operating conditions, a lower diesel fuel injection rate was found to produce acceptable performance. Best performance was obtained with standard diesel injection timing and with the injection of the methanol at idle occurring 14 crank angle degrees after the diesel.

Since the glow plugs were removed to accommodate this modification, cold-start evaluations were inappropriate. After several minutes of warm-up, however, the car in the dual-fuel mode had good acceleration and driveability, produced no visible emissions, and could readily follow the FTP driving cycle. Performance, in fact, was subjectively equivalent to operation on diesel fuel.

This system, however, was not problem-free. During the initial hot-start emissions test, the performance dropped off and the hydrocarbon emissions peaked-out offscale. The problem was traced to failure of the diesel injection pump. Failure of the pump was primarily attributed to the increased side load on the pump pulley resulting from the increase in power to drive the methanol pump. This factor is abstruse and was not foreseen in the initial layout of the dual-injection system. It did not become apparent until a careful analysis was made of the pump failure.

The diesel injection pump was replaced, and pulley adapters were fabricated to drive the methanol injection pump directly from the engine crankshaft. With the new diesel injection pump installed, HC and NO_x emissions increased about 50 percent and fuel consumption remained the same, relative to the previous baseline values. A representative from Bosch verified that the replacement pump was the correct model. He stated that pumps installed at the factory are identified by an "005", whereas replacement pumps are identified by an "007" and a "P" (the "P" designated that special preservatives have been applied to increase shelf life). He further stated that the pumps with an "005" and an "007" are identical in every aspect. Several additional checks failed to uncover any specific cause for this shift in emissions. Therefore, a new baseline was established and the dual-fuel emissions evaluations were resumed.

Results of representative emissions tests over the UDDS cycle (505 plus 867 of the FTP), with the engine warmed-up, are given in Table 23. In dual-fuel operation, HC and CO emissions and fuel consumption increased, and NO_x and particulates decreased. Directionally, these results are as expected, although some increases were greater and some decreases were somewhat less than desired. Considering the required system compromises and the limited amount of system optimization allotted to this task, the results are considered to be quire promising. With dual-fuel operation, the amount of diesel fuel used was reduced by 70 percent.

The two areas of primary concern are HC and fuel consumption, and these will be discussed in some detail. Generally, the other emissions were in apparent good agreement with other data; such as that obtained with a Volvo TD-100C, evaluated in another project.(6) Results with the Volvo for two 13-mode tests (01-03 and 06-01) were as follows:

	HC	CO	NO_x	Part.	Fuel
Dual Fuel/Diesel	140%	310%	45%	45%	104%*

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*105% when adjusted for differences in maximum power

It should be noted that the Volvo had undergone an order of magnitude more development and optimization toward operation over the respective test procedure and that the 13-mode and FTP tests are not directly comparable. With these qualifications, it appears that the results for the two different engines were similar.

Reductions in HC and fuel consumption would be expected by the following modifications to the VW Rabbit:

- Optimization of the methanol injection location and direction
- Optimization of the diesel pilot injection system
- Optimization of injection timing and duration over the speed and load range of the engine
- Optimization of the compression ratio

TABLE 23. HOT-START RESULTS WITH DUAL FUEL-DUAL INJECTION VW RABBIT

Portion of FTP Cycle	Fuel	Emissions, g/km				Grams		Fuel, grams		
		HC	CO	NO_x	Part.	CO_2	Total C as CO_2[a]	Diesel	Meth.	Equiv. Diesel
505	D	0.22	0.60	0.81	0.15	904	913	298	0	298
768	D	0.23	0.65	0.85	0.15	1051	1062	346	0	346
UDDS	D	0.22	0.63	0.83	0.15	1955	1975	644	0	644
505	D+M	0.81	2.30	0.30	0.10	963	999	86	599	357
867	D+M	0.96	2.03	0.42	0.08	1101	1139	104	649	397
UDDS	D+M	0.89	2.16	0.37	0.09	2064	2138	190	1248	754
D+M/D		400%	340%	45%	60%	--	114%[b]	30%	--	117%
D/D Baseline[c]		125-140%	80-95%	90-95%	65-70%	--	96-100%	96-100%	--	--

---

[a] Total C from HC, CO and CO_2

[b] Adjusted for total BTU content of the hydrocarbon portion of the fuel for the diesel plus methanol evaluations (1.054 Factor)

[c] Values in current test with diesel compared to range of values in the baseline tests

Other possibilities are:

- Effect of a glow plug on warmed-up operation
- Design of the prechamber

Some of the above could also affect particulate emissions. The level of effort allotted to these dual-fuel evaluations, however, did not allow for extensive optimization.

Some of the known contributors to the increase in fuel consumption, over the UDDS cycle, are as follows (values are approximations):

• Increase in diesel flow rate at idle	2.5%
• Higher HC and CO emissions	2.5%
• Power to drive methanol injection pump	2.5%
Total from sources listed above	7.5%

The increase in heat input with dual-fuel operation was about 15 percent, and approximately half of that can be accounted for by the three contributions listed.

Characteristics of the system, the installation, the adjustments made, and the test results are briefly resummarized as follows:

- *Glow plugs were removed* and alcohol injectors were installed in their place

- Start of injection was set to provide *best compromise* over speed and load range

- Maximum alcohol injection rate was set to give an *acceleration rate equivalent* to that obtained with diesel between 48 and 97 km/h (30 to 60 mph).

- A *constant* diesel *pilot injection* pump setting was utilized. With dual-fuel (diesel pilot and methanol primary), relative to diesel only, HC and CO emissions and total fuel consumption increased, and NO_x and particulate emissions decreased. Consumption of diesel fuel decreased by 70 percent.

6. Diesel-Methanol Blend

A determination of the maximum percentage of methanol that can be utilized, and still produce satisfactory operation at a steady-state condition, was conducted with the VW Rabbit. Above this "maximum amount," engine roughness became noticeable. The methanol was introduced into the fuel supply line at the entrance to the injection pump assembly. The results with and without the addition of methanol were as follows:

	Values at 64 km/hr (40 mph)						
	Emissions, g/km				Fuel Consumption, ℓ/100 km		
Fuel	HC	CO	NO_x	Part	Diesel	Meth.	Die.%
Diesel Fuel	0.07	0.26	0.40	0.10	4.17	0	100
Diesel & Methanol	0.24	0.52	0.44	0.15	3.71	1.07	89*

*Relative to initial run with diesel fuel only

Addition of 1.07 ℓ/100 km of methanol decreased the consumption of diesel fuel by 0.46 ℓ/100 km/ This amounts to an 11 percent reduction in diesel fuel by addition of the "maximum amount" of methanol, without readily apparent engine roughness. Assuming lower heating values of 44.2 kJ/g (19,000 Btu/lb) for the diesel fuel and 20.0 kJ/g (8,600 Btu/lb) for methanol, there was only a few percent difference in total energy input per kilometer between the two fuels. HC, CO, and particulate emissions increased with the addition of the methanol.

F. Water Injection in a 1981 Mercedes - Car 64

A 1981 model Mercedes-Benz 300SD, with experimental EGR and water injection systems, was obtained from Mercedes-Benz. In this car, the water is injected into the intake prior to the turbocharger, at flow rates scheduled by an electronic control unit. An adjustable control on the electronic unit enabled changing the rate of water injection.

Initially, the car was evaluated as received, without the water injection, to verify that no significant changes occurred during shipment. The results of these evaluations are summarized as follows:

		Emissions, g/km				
Data Source	Test	HC	CO	NO_x	Part.	Fuel ℓ/100 km
Mercedes	FTP	0.16	0.70	0.62	0.19	9.4
SwRI	FTP	0.23	0.63	0.65	0.23	9.7
SwRI/Mer.		145%	90%	105%	120%	103%
Mercedes	HFET	0.11	0.73	0.42	--	8.1
SwRI	HFET	0.13	0.47	0.40	--	8.1
SwRI/Mer.		120%	65%	95%	--	100%

As shown, the NO_x and fuel consumption values agreed within plus or minus five percent between the two laboratories. The CO was somewhat lower, and the HC and particulates were higher in the results obtained by SwRI.

The results with water injection, at a rate of 60 to 70 percent of the fuel flow, are shown as a percentage of the baseline values in Table 24.

TABLE 24. EFFECT OF WATER INJECTION ON EMISSIONS

Data Source	Test	Water Injection/Baseline, percent				
		HC	CO	NO_x	Part	Fuel
Mercedes	FTP	92	107	71	113	100
SwRI	FTP	93	135	76	108	104
Mercedes	HFET	87	71	83	---	100
SwRI	HFET	92	123	80	---	107

With water injection, the reduction in HC and NO_x and the increase in particulates were consistent between the results obtained by Mercedes and SwRI. The CO emissions and fuel consumption increased with water injection at SwRI and remained essentially the same or decreased at Mercedes. It should be noted that these fuel consumption increases at SwRI are based on the results of one test for the HFET and two for the FTP.

In these evaluations with this water injection system, particulates increased approximately ten percent, and the hydrocarbons decreased by an equivalent amount. The relatively samll changes in carbon monoxide and fuel consumption are not considered to be of any major significance. Oxides of nitrogen were reduced by 20 to 30 percent with water injection.

A series of hot-start evaluations were then conducted to determine whether the water setting used was optimum, and to determine the effect of water injection on fuel consumption. The actual water flow rates were not essential to optimization and were not determined. Results of these hot-start emissions tests, over one UDDS, are summarized in Table 25.

Based on the data in Table 25, the optimum water flow setting was somewhere between 2.5 and 7.5 on the control knob. Also, a 2.5 to 5.0 setting produced emissions which were similar to those obtained with the control set on "automatic." Therefore, the water flow rate with the control set on "automatic" appears to be a good compromise between water flow rate and reduction of NO_x emissions. At the 2.5 and 5.0 settings, the average reduction in NO_x were 25 and 30 percent. These values are within the range of the reductions obtained with the control set on "automatic" in the hot-strat and cold-start evaluations. In the hot-start tests at the 5.0 setting, HC increased by about 30 percent and CO by about 20 percent. In the previous cold-start tests, there were no significant changed in HC. Based on the results of this series of hot-start tests, water injection did not have any significant effect on fuel consumption.

TABLE 25. HOT-START UDDS WATER INJECTION EVALUATIONS

Test No.	Water Setting[a]	Emissions, g/km HC	Emissions, g/km CO	Emissions, g/km NO_x	Fuel, ℓ/100 km	NO_x as % of "Off" Value
6440H1	Autom.	0.17	0.70	0.47	9.25	70
6449H1	Autom.	0.17	0.64	0.49	9.33	75
64H0-1	Off	0.14	0.60	0.64	9.09	--
64H1C1	0	0.14	0.55	0.63	9.13	100
64H3C1	2.5	0.17	0.64	0.50	9.18	75
64H5C1	5	0.19	0.70	0.45	8.95	70
64H7C1	7.5	0.19	0.73	0.42	9.00	65
64H9C1	10	0.18	0.71	0.44	9.28	65
64H5C2	5	0.17	0.66	0.47	9.12	70
64H0-2	Off	0.13	0.57	0.68	9.18	--
644XH2	25%[b]	0.15	0.65	0.56	--	85

---

[a] Setting based on control knob fully counter clockwise at 0 (no water) and fully clockwise at 10.

[b] Water flow rate by volume as a percentage of the fuel flow rate.

At a composite water flow rate of about 25 percent of the fuel flow rate, NO_x was reduced 10 to 15 percent. This data point further verifies that a substantial water flow rate is required to obtain a substantial reduction in NO_x emissions.

Not shown directly by these data is that the measured reduction in calculated NO_x emissions at high water flow rate is significantly affected by the humidity within the dynamometer test cell. If water injection becomes a viable method for controlling NO_x emissions in diesel cars, the question of appropriate humidity correction factors should be evaluated. This subject is discussed in Appendix A-2.

Filters were extracted from tests with and without water injection (in automatic mode), to determine whether water injection affected the amount of organic extractables. The results are summarized as follows:

	Water Injection	Particulates g/km	Organics, Percent*
6441-2	No	0.226	9.3
6441C2	Yes	0.241	9.5

---

*Based on the extraction of 500 mm by 500 mm Pallflex filters

With water injection, the percent of organic extractables was essentially the same as without water injection. The amount of extractable organics increased in essentially direct proportion to the increase in total particulates. Therefore, it appears that a nominal 25 to 30 percent reduction on NO_x was attained, using water injection, with a nominal ten percent increase in total and organic particulates.

G. Organic Extractables

A primary interest in this study was reduction of the amount of organic extractables. The organic extractable portion of the particulate produces a positive response in Ames evaluations.

Results of all data from organic extractions conducted in this project (including those from the following section on trap durability) are summarized in this section. All data presented are from extractions of 500 mm by 500 mm (20 inch by 20 inch) Pallflex filters using methylene chloride as the solvent. A milligram per kilometer value has been calculated using the particulate rate derived from 47 mm Pallflex filters along with the fraction of extractables derived from the 500 mm Pallflex filters.

The results of the organic extraction data are given in Table 26. The cars are identified as follows:

Car	Year and Description
61	1980 Mercedes-Benz 300SD
62	1980 Oldsmobile Delta 88
63	1980 Volkswagen Rabbit
64	1981 Mercedes-Benz 300SD
65	1981 Datsun Maxima

To facilitate review, these data have been reformatted, and the results are given in Table 27. There are two findings of primary interest derived from these data.

One finding is that the percent of extractable organics with the two Mercedes 300SD cars was only about one-third that of the other three cars evaluated. The Mercedes in the baseline configuration emitted organic extractables at a rate similar to those of two of the other cars with particulate traps.

Another finding was that there did not appear to be any relationship between the efficiency of a trap for removal of total particulate and for removal of organic extractables. In fact, it appears that all of the traps evaluated had similar efficiencies for reduction of organic extractables. Catalytic treatment appeared to have no effect on organic extractables. Metal mesh trapping media, however, did appear to be somewaht more effective than the ceramic substrates for reducing organic extractables. This finding has a number of potentially significant implications, and could be worthy of additional evaluation.

TABLE 26. SUMMARY OF ORGANIC EXTRACTION DATA

Car	Configuration	Particulates, mg/km Total	Particulates, mg/km Org. Ext.[a]	Percent O.E.[a]
61	Baseline	220	18	8
	Corning Trap	40	8	20
	Texaco Trap	70	4	5
	W.R. Grace-Non Cat.	130	10	8
	Durability w/o Trap	270	17	6
	Durability-Corning Trap	27	4	14
62	Baseline	280	65	24
	Corning Cat. Trap	80	17	21
	Johnson Matthey Trap	140	11	8
63	Baseline	220	65	29
64	Baseline	230	21	9
	Water Injection	240	22	9
65	Baseline	160	45	28
	NGK Trap	40	12	30

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[a] Organic Extract

TABLE 27. REGROUPED ORGANIC EXTRACTION DATA

Car	Configuration	Particulates, mg/km Total	Particulates, mg/km Org. Ext.[a]	Percent O.E.[a]
61	Baseline	220	18	8
62	Baseline	280	65	24
63	Baseline	220	65	29
64	Baseline	230	21	9
65	Baseline	160	45	28

Configuration	Percent Removal[b] Total	Percent Removal[b] Org. Ext.
Corning Trap-Initial	80	55
Corning Trap-Durability	90	75
NGK Trap	75	75
Texaco	70	80
Corning Catalyzed Trap	70	75
Johnson Matthey Trap	50	85
W.R. Grace-Non Cat.	40	75

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[a] Organic Extract

[b] Percent reduction relative to respective baseline value

VI. SYSTEM OPTIMIZATION AND DURABILITY TESTING

Particulate traps were selected to undergo durability evaluations. System "optimization" involved only those "preparations" necessary to enable conducting durability evaluations of the particulate traps. The durability testing involved distance accumulation on the road, with the trap mounted on a vehicle. All regenerations were conducted in the laboratory with the vehicle operating on a chassis dynamometer.

A total of four different particulates traps were considered for evaluation in this project task. Included were two metal mesh traps, a Johnson Matthey catalyzed and a Texaco noncatalyzed; and two noncatlyzed ceramic substrates, a Corning and a NGK. Examples of diesel particulate traps evaluated are shown in Figure 3.

A. Durability Criteria and Preparation

The durability goal was 80,000 kilometers (50,000 miles) of distance accumulation with the particulate trap mounted on a vehicle. Distance accumulation was to be accomplished in operation on the road. The regenerations could either be performed on the road or in the laboratory, as appropriate.

The purpose of the durability evaluation was primarily to determine if traps could remain effective over 80,000 kilometers of operation. It was recognized early that development of an automatic, road-worthy regeneration system was beyond the scope of this project. Therefore, no attempt was made to regenerate the traps during operation on the road.

Regenerations, however, were to be performed with the trap remaining on the vehicle. Also, a regeneration method that was self-contained on the vehicle was preferred to methods requiring external inputs for obtaining the trap temperature needed for regeneration.

Preparation of the ceramic traps for durability initially involved assembly of the trap substrate into the container. A minimum of one continuous layer of 3M Interam Heat Expandable Ceramic insulation (Part No. WZ7311, 1050 g/m^2, BT 212, Lot No. 9001, Roll No. 8) was wrapped around the ceramic substrate prior to installation into the container. The criteria used was a tight fit that barely allowed insertion of the substrate into the container using a moderate force applied by hand. A gasket material obtained from Walker Manufacturing Company, consisting of woven wire surrounded by heat resisting fibers, was used to seal and cushion the entrance and exit of the substrate in the container. The preload in these end gaskets, upon closure of the container, was controlled such that total collapse of these gaskets was nearly attained. This resulted in the substrate being securely held in place with no appreciable radial or axial preload. All metal mesh particulate traps evaluated were received at this laboratory as complete assemblies.

The outside of the trap container was then insulated with two layers of a ceramic fiber insulation (WRP-A-AQ FELT made by Refactory Products Company) and protected by a thin sheet metal covering. The exhaust pipe from the engine to the trap was also insulated. The traps were mounted under the front floorboard of the vehicles. After mounting the trap in the exhaust system on the vehicle, supports and a protective shield under the trap were fabricated, as appropriate. Minimum road clearance of the cars was generally reduced with a trap installed.

Following installation of the trap, efforts were expended toward developing a method for satisfactory regeneration. Based on the previous experience in the particulate emission control task of this project, throttling of the intake air was the method of choice. With the two systems that completed a significant amount of distance accumulation in this durability testing task, throttling of the intake air provided satisfactory regeneration.

B. Johnson Matthey Particulate Trap

A decision was reached to initiate durability evaluation of a Johnson Matthey catalyzed metal mesh trap on the 1980 Oldsmobile Delta 88 diesel. The trap evaluated in the particulate emission control task was modified by Johnson Matthey to increase trapping efficiency. The EGR system on the Oldsmobile was to remain operable for this durability evaluation.

The Johnson Matthey trap utilized radial flow of the exhaust through the catalyzed metal mesh filter. A relatively small amount of alumina was reportedly used.

The replacement trap was received from Johnson Matthey, and the results of the initial (zero distance) baseline test on the Oldsmobile, with and without the trap installed, are summarized as follows:

	Emissions, g/km				Fuel
Condition	HC	CO	NO_x	Part.	ℓ/100 km
Without Trap	0.25	0.74	0.90	0.265	11.65
	0.24	0.71	0.85	0.304	11.56
	0.25	0.73	0.88	0.28	11.6
With J-M Trap	0.05	0.20	0.80	0.106	11.68
	0.06	0.19	0.75	0.113	11.72
	0.06	0.20	0.78	0.11	11.7

Particulate emissions with this particulate trap were lower than with the previous unit, and were below the level of the 0.124 g/km standard. Other emissions and fuel consumption, both with and without the trap, are in agreement with results previously obtained.

Difficulties were experienced in the regeneration attempts with this trap. Initial regeneration attempts utilized the 90-seconds-at-WOT-in-neutral method that was recommended by the representative from Johnson Matthey. The loading of the trap and the regeneration attempts are described as follows:

Condition	Distance On trap, km	Exhaust Backpressure at 64 km/hr, kPa		Regeneration Temperatures, °C	
		Before Regen.	After Regen.	Inlet	Outlet
Without Trap	--	5	--	--	--
Initial with Trap	0	7	--	--	--
After First Rest	55	8	--	--	--
After Final Test	250	10	--	--	--
190 km on Road	450	17	15	420	415
3 min WOT in neutral	465	15	12	480	500
90 km on Road	575	20	--	--	--
6 min WOT in neutral	575	20	12	530	560
90 km on Road	685	24	N.A.	"See Text"	

As illustrated by these data, good regenerations were not obtained.

Effort was directed toward achieving good regeneration. At first, the trap temperature was increased by maintaining the WOT in neutral for six minutes, rather than three minutes. It should be pointed out that the temperature halfway down the outside of the cylindrical substrate was consistently about 50°C lower than the temperature at the trap inlet. After complete regeneration was not achieved by extending the WOT in neutral, the two methods previously recommended by the representative from Johnson Matthey were combined in an attempt to achieve the temperatures necessary for complete regeneration. The procedure used was: run at WOT in neutral for 4 minutes to get the trap warmed-up, put transmission into drive and WOT accelerate to highway speed, and then repeat if temperature traces indicated that a good regeneration had not been acheived. Immediately after backing off from the WOT acceleration, however, a catastrophic temperature rise occurred within the trap. The trap outlet temperature exceeded the 1000°C fullscale temperature on the recorder, resulting in significant meltdown of the trapping material and "burning" a hold through the trap container.

The Johnson Matthey trap damaged during the attempted regeneration was returned to Johnson Matthey. The representative from Johnson Matthey indicated that the damage experienced was the most severe he had seen. He stated that the use of an air pump, to provide additional air at conditions above about two-thirds of maximum throttle, should eliminate the recurrence of the situation we had experienced. He also stated that the trapped particulate become harder to ignite after unsuccessful regeneration attempts and that, when ignited, the rate of combustion tends to be more rapid.

Prior to the time a replacement trap could be provided, Johnson Matthey was well along on a durability demonstration of their own, involving a Johnson Matthey trap on a Volkswagen Rabbit. Based on the several factors involved, it was decided not to duplicate such a durability demonstration.

C. Texaco Particulate Trap

The Texaco noncatalyzed, alumina-coated, metal mesh particulate trap was considered as a candidate for durability evaluation. The available Texaco trap was returned to Texaco for replacement of the metal mesh filter and structural strengthening modifications, since the original configuration (EO 1&2) was prone to structural failure after repeated temperature cycling.

Durability testing of the Texaco trap (BA 31&32) on the Oldsmobile was attempted. The primary expected difficulty in the use of the Oldsmobile for evaluating the Texaco trap, was attaining the temperatures necessary for regeneration. Preparatory effort involved the development of a method for regeneration and a determination of whether a muffler was needed when the Texaco trap was used.

In sound level determinations, made with the standard exhaust system and with the trap installed and muffler removed, it was found that the Texaco trap provided adequate sound attenuation. The determinations was made two ways: using a sound meter, and subjectively. Conditions evaluated were idle, acceleration, and 64 km/h steady-state operation on the road. These evaluations were conducted from inside the car and from the side of the road. In all cases, the sound levels with the trap were equal to, or slightly lower than, the sound levels with the standard muffler. Therefore, the muffler was removed when this trap was used.

Texaco provided some data on temperature and oxygen level requirements for good regeneration. In addition, they recommended use of the same regeneration method utilized at Texaco. That method involved removing the trap from the car (or providing an exhaust by-pass switching system) and regenerating the trap in exhaust which is heated by the catalytic oxidation of propane fuel added to the exhaust. This regeneration method was not used because of time and cost and because it deviated from the self-contained, on-the-vehicle concept of regeneration that was desired.

Readily obtainable operating parameters were evaluated, without the trap installed, in an effort toward development of a suitable regeneration method. The wide-open-throttle-in-neutral method was investigated, with and without throttling of the intake air. With intake throttling, the required temperature and oxygen concentrations could be achieved, but the resulting surging of the engine, at the governed engine speed, produced excessive amounts of black smoke in the exhaust.

The next method evaluated was operation on the chassis dynamometer with various combinations of transmission gear, dynamometer loading, and intake throttling. It was found that the best overall condition was a combination of low gear, maximum dynamometer horsepower at 56 km/h (35 mph), and throttling as needed to get the required temperature. Exhaust with a temperature of 650°C and about five percent oxygen, and with no readily visible exhaust emissions, could readily and repeatedly be attained. This method was found to be effective for regeneration of the Texaco trap on the Oldsmobile.

This regeneration method involved operation of the 1980 Oldsmobile at 56 km/h (35 mph) in low gear with a dynamometer power setting of 32 kilowatts (45 horsepower), and with intake throttling as required to increase the exhaust temperature to greater than 600°C with exhaust oxygen greater than 3.5 percent. After "light-off" of the collected particulate, the trap exit temperature increased significantly and the exhaust oxygen content decreased to a very low value. This limitation of available oxygen appears to be the controlling factor in the rate of regeneration. In the several regenerations conducted, the maximum exhaust temperature at the exit of the trap was approximately 800°C.

The zero distance, baseline emissions testing was then initiated with the Texaco trap on the Oldsmobile. During the emissions testing with the trap installed, however, it was determined that the trap was leaking exhaust at the sealing surfaces of the assembly flanges. This same situation occured in the previous evaluations with the initial Texaco trap assembly. The solution at that time was to disassemble the flanges, install gaskets, and replace many of the assembly bolts. These traps came with metal-to-metal contact at these flanges. The methods again applied to resolve these leaks were to assure that the surfaces were flat, install gaskets, and use high-strength bolts.

The EGR system on the car was left in operable condition throughout the evaluations of this trap. This was expected to increase the rate of particulate build-up on the trap, due to a probable increase in particulate output of the engine as the trap loads with particulate. As the trap loads with particulate, the exhaust backpressure increases. The EGR rate increases as the exhaust backpressure increases, and higher EGR rates can produce higher particulate rates.

Zero distance, baseline emissions testing, with and without the Texaco trap on the Oldsmobile, are summarized on the following page.

With Test 6200T2, the particulates increased and there was a question relative to fuel consumption. Therefore, Test T3 was run, and the particulate increased even more. Between Tests T3 and T4, some hot-start evaluations were conducted, and the trap was regenerated. The cause for the shift in fuel consumption could not be determined.

Condition	Test	Emissions, g/km				Fuel, ℓ/100 km
		HC	CO	NO_x	Part.	
Without Trap	6200-1	0.23	0.80	0.90	0.332	11.7
	6200-2	0.22	0.77	0.97	0.339	11.9
		0.23	0.79	0.94	0.34	11.8
Texaco Trap	6200T1	0.08	0.77	0.69	0.112	(10.9)
	6200T2	0.13	0.86	0.63	0.153	(10.9)
	6200T3	0.12	0.99	0.65	0.242	12.4
	6200T4	0.10	0.92	0.66	0.133[a]	11.8
		0.11	0.89	0.66	--	--

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[a] Immediately after a regeneration

The results of a series of hot-start tests over one UDDS (Bag 2 and Bag 3) are summarized and compared with prior and subsequent cold-start tests as follows:

Condition	Test Series	Emissions, g/km				Fuel, ℓ/100 km
		HC	CO	NO_x	Part.	
Cold Start T3	--	0.12	0.99	0.65	0.242	--
After Test T3	62HS-1	0.12	0.96	0.64	0.270	11.6
After Regen.	62HS-2	0.09	0.82	0.65	0.135	11.7
Cold Start T4	--	0.11	0.92	0.66	0.133	--
W/O EGR	62HS-3	0.08	0.65	0.84	0.093	11.2

These results, along with the previously summarized cold-start results, clearly indicate that the trapping efficiency of this trap decreased as the trap loaded with particulates, and that the trapping efficiency improved greatly following regeneration.

This decrease in trapping efficiency was discussed with the Texaco representative. He stated that they had experienced some decrease in efficiency with loading, but that they had never seen it occur at so rapid a rate. At Texaco, however, the EGR system was disabled in all trap evaluations using an Oldsmobile diesel.

In the zero mile emissions testing, the trapping efficiency decreased by fifty percent after only 90 kilometers of operation. In the hot-start series of evaluations with the trap installed, one test was run with the EGR system disabled. In that test without EGR, CO and particulates were reduced by approximately thirty percent and NO_x was increased by thirty percent. This NO_x level with the trap and without EGR, however, was about the same as the baseline NO_x level without the trap. The EGR rate is directly affected by an increase in exhaust backpressure, theoretically as a function of the square root of the backpressure. In addition, the amount of residual exhaust in the cylinders is also affected by an increase in exhaust backpressure. The particulate emission rate generally increased with increase in EGR. This factor probably accounts for the difference in the rates of decrease in trapping efficiency reported by Texaco.

These findings with the Texaco trap indicate that:

- This system, as evaluated, exceeded the level of the 0.124 g/km particulate standard shortly after regeneration.
- Based on the increase in pressure drop across the trap, about 200 kilometers can be driven before this trap would require regeneration. Based on the emissions results, however, there would be little overall decrease in particulate emissions.
- Without development of a more efficient regeneration method, regeneration at intervals of less than 160 kilometers was considered to be very costly considering the available funds.
- The EGR appears to be a major contributor to the problems encountered with this trap. Disabling the EGR should be considered, if evaluation of the trap itself is the primary purpose.

Accordingly, durability of the Texaco trap was not evaluated in this project.

D. Corning Particulate Trap

The Corning cellular, monolithic, ceramic substrate (EX-47, 5.66 inch diameter x 12 inch length) was to undergo durability evaluation on the 1980 Mercedes 300SD. This was the same unit as previously tested in the particulate emission control task of this project.

Following duplicate baseline evaluations of the 1980 Mercedes, without the trap installed, the trap was mounted on the car and readied for durability testing. For operation over the road, the trap was firmly supported and a metal shield was mounted under the trap. The clearance between the bottom of the metal shield and the road was approximately four inches. In a test drive around the road route to be used, this clearance appeared to be acceptable. This small clearance did require that the drivers maintain adequate caution.

The results of the initial (zero miles) baseline tests, with and without the trap installed, were as follows:

	Emissions, g/km				Fuel,
	HC	CO	NO_x	Part.	ℓ/100 km
Without Trap	0.11	0.63	1.07	0.302	10.13
	0.11	0.59	1.06	0.302	10.04
	0.11	0.61	1.07	0.30	10.1
With Corning Trap	0.07	0.60	1.11	0.026	10.39
	0.08	0.62	1.03	0.034	10.38
	0.08	0.61	1.07	0.030	10.4

In general, these results were in good agreement with the results from the most recent previous evaluations. It appears that the particulate emissions, without the trap installed, had increased somewhat. Particulate emissions were about 0.23 at the start of Task III and about 0.27 at the end of Task III. For this baseline, the particulates were at 0.30. With the trap installed, the particulate emissions generally agreed with the results obtained in the final evaluation of this trap in the previous Task III.

EPA specified that particulate sufficient to yield 150 mg of extract be collected on 500 mm by 500 mm (20 by 20 inch) Pallflex filters. These filters were to be stored until the end of the project, at which time they were to be extracted. The available 20x20 Pallflex filter system sampled approximately 20 percent of the total diluted exhaust. Without the trap, the 150 mg requirement could be readily met. With the trap, however, meeting this requirement became difficult, requiring a number of FTP evaluations. With the trap, 20 by 20 Pallflex filters were taken during the two FTP evaluations plus one day of hot-start operation over the UDDS cycle (the 505 second transient plus the 867 second stabilized portions of the FTP). This resulted in 20 by 20 Pallflex filter samples being taken over a total of 16 UDDS cycles, and was expected to result in approximately 150 milligrams of organic extract. At a few of the test points, a minimum of 60 milligrams of extract was specified.

Service accumulation was initiated with the Corning trap installed on the Mercedes. The exhaust backpressures are summarized as follows:

	Exhaust Backpressure, kPa			
	Before Regeneration		After Regeneration	
	64 km/h	97 km/h	64 km/h	97 km/h
Initial When New	--	11	--	--
After Baseline Testing	--	--	--	13
Initial for Durability	--	--	7	15
After 0 Mile Testing	--	--	8	16
After 182 km	18	35	9	19
After 365 km	19	36	13	24

As apparent from these data, the regenerations did not reduce the backpressures to the initial values. After the 365 kilometers of service accumulation, the backpressure after regeneration remained at such a high level that continuation was considered to be impractical. At this point, the trap was disassembled.

In appearance, the trap substrate was clean in the center cells and was nearly plugged up around the outside cells. It was also noted that, due to the lack of diametrical uniformity of the ceramic substrate, a continuous layer of insulation had not been installed between the substrate and the container. It appeard that the temperature within the outside row of cells did not get high enough for regeneration. The next time regeneration was attempted, the row just inside of that row apparently did not get hot enough. This process then apparently continued to each successive regeneration attempt.

The substrate was then placed into an oven and heated to 1300°F with some air circulating through the oven. After attaining the 1300°F and holding this temperature for several hours, the oven was shut off and allowed to cool before removal of the substrate. The substrate, except for some slight discoloration, appeared to have completely regenerated. Any loose particulates remaining within the substrate was removed by gentle bumping against a soft surface.

In order to allow for the installation of a uniform layer of insulation around the ceramic substrate, the diameter was reshaped by careful rubbing against a flat concrete surface. Upon reinstallation into the container, a continuous layer of 1.6 millimeter thick Interam insulation was installed around the substrate. After assembly, the trap was reinstalled on the Mercedes and the backpressure readings were as follows:

	Exhaust Backpressure, kPa			
	Before Regeneration		After Regeneration	
	64 km/hr	97 km/h	64 km/h	97 km/h
Initial for Durability	--	--	7	15
Regeneration in Oven	13	24	7	15
After 190 km	14	27	7	15

Therefore, it appears that the trap had been effectively regenerated in the oven and during the subsequent regeneration on the car. For this, and all subsequent regenerations, special effort was made to assure essentially complete regeneration of the trap.

Initially, an exhaust backpressure of 12.5 kPa (50 inches of water) at 64 km/h (40 mph) was selected as the point at which the car should be brought in for regeneration. This, however, resulted in the car arriving at inconvenient times, at which regeneration would have to be delayed. Therefore, an investigation was made as to whether a higher limit on the exhaust backpressure would have any readily noticeable effect on the operation of the car.

It was subsequently determined that a pressure drop across the trap as high as 25 kPa at 64 km/h did not produce any change in performance of the car that was of concern to the driver. Therefore, in order to greatly improve the efficiency of the distance accumulation evaluation, it was decided to regenerate once per eight-hour work shift. With this change, the trap was regenerated in the morning, then the car went onto the road for about seven hours, after which the trap was again regenerated. The car then went onto the road for up to eight hours in the evening. The pressure drop across the trap normally approached 25 kPa at 64 km/h prior to regeneration. Distance accumulation between regenerations generally ranged from 250 to 350 kilometers.

The pressure drop across the trap after regeneration was found to be a function of the "effectiveness of the regeneration." Complete regeneration was found to be more difficult when the trap was lightly loaded, and for one or two attempts following an incomplete regeneration.

For the regeneration, a dynamometer power setting about 50 percent higher than the certification setting and a speed of 100 km/h were utilized. During the regeneration, the fuel throttle was fully depressed against a stop and the speed was controlled by an air throttle, installed by SwRI in the air intake just after the turbocharger. With a clean trap, under these operating conditions, the oxygen level in the exhaust was approximately 3.5 percent. During regeneration, the exhaust oxygen level after the trap decreased in accordance with the rate of particulate burn-off.

A regeneration cycle of fourteen minutes, from start of intake air throttling to cooldown of the trap, was used. Of the fourteen minutes in the regeneration cycle, about two to three minutes were required to initiate burn-off of the particulate and about two to four minutes were required to burn-off most of the particulate. The additional eight minutes at regeneration conditions were to assure that regeneration had been carried out to completion.

Maximum exhaust gas temperature at the trap exit during regeneration was 760°C (1400°F), and the maximum temperature increase of the exhaust gas across the trap was 100°C. The rate of particulate burning was primarily controlled by the inlet temperature and the amount of oxygen available in the exhaust gas.

Overall, this regeneration method was concluded to be the simplest and most reliable method of regeneration control for use in this evaluation. Without good control over the regeneration, the durability evaluations could end up being a test of the reliability of the regeneration method, rather than of the durability of the trap.

Emissions were determined during regeneration, and these results are summarized as follows:

	Values in g.km with Trap Installed			
	FTP Values	Actual Regen.[a]	Regen. Cycle[b]	Previous Data 97 km/h
Hydrocarbons	0.08	0.02	0.01	0.02
Carbon Monoxide	0.6	4.5	1.8	0.4
Oxides of Nitrogen	1.0	1.3	1.3	1.6
Particulates	0.03	0.03	0.03	0.03
Sulfate	--	0.001	--	--

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[a] Value obtained during regeneration of aloaded trap at 100 km/h with throttling

[b] Regeneration cycle of 100 km/h with throttling conducted on a clean trap

Carbon monoxide and particulates were increased by regeneration, but such increase did not appear to be excessive.

Assuming FTP's were used for distance accumulation and assuming a total accumulation, including regeneration, of 200 kilometers per complete regeneration cycle, the results would be as follows:

	Emissions in g/km			
	HC	CO	NO_x	Part.
FTP Test	0.08	0.6	1.0	0.030
FTP's & Regen.	0.07	1.1	1.0	0.033

These data indicate that the emissions produced during regeneration do not greatly increase the overall emission rates of this car. In addition, a relatively low rate of sulfate emissions (0.001 g/km) was produced during regeneration.

At the start of the distance accumulation, the pressure drop across the trap, at 64 kilometers per hour following a good regeneration, was about 4 kPa (16 inches of water). Toward the 80,000 kilometer completion of distance accumulation, the pressure drop following a good regeneration was about 5 kPa. Toward the end of the distance accumulation, regeneration was somewhat more difficult to accomplish that at the start. The difference, however, was not great.

The average results of the emissions tests conducted during the distance accumulation are summarized in Table 28. The averages and the standard deviations for the entire 80,000 kilometers of distance accumulation are summarized in Table 29.

TABLE 28. EMISSIONS SUMMARY FOR CORNING TRAP DURABILITY
1980 Mercedes 300SD with Corning Noncatalyzed Trap

Average of the Test Values, at distance in km

STANDARD CONFIGURATION (Without Trap)

		0	8000	16000	24000	32000	40000	48000	56000	64000	72000[a]	80000
Hydrocarbons,	g/km	0.11	0.11	0.12	0.09	0.08	0.09	0.09	0.10	0.09	0.09	0.10
Carbon Monoxide,	g/km	0.61	0.65	0.60	0.60	0.58	0.58	0.61	0.61	0.58	0.61	0.62
Oxides of Nitrogen,	g/km	1.07	0.99	0.92	0.97	0.91	0.97	0.91	0.94	1.00	0.93	0.90
Particulates,	g/km	0.30	0.29	0.27	0.26	0.24	0.25	0.28	0.37	0.26	0.27	0.29
Fuel Cons.,	ℓ/100 km	10.1	9.9	9.6	9.7	9.7	9.9	9.7	9.7	9.7	9.3	9.4

WITH CORNING TRAP

		0	8000	16000	24000	32000	40000	48000	56000	64000	72000[a]	80000
Hydrocarbons,	g/km	0.08	0.07	0.08	0.06	0.07	0.06	0.07	0.05	0.06	0.04	0.07
Carbon Monoxide,	g/km	0.61	0.61	0.60	0.65	0.58	0.59	0.63	0.61	0.62	0.61	0.58
Oxides of Nitrogen,	g/km	1.07	0.92	0.88	0.93	0.87	0.88	0.94	0.96	0.87	0.90	0.91
Paritculates,	g/km	0.030	0.029	0.028	0.030	0.023	0.032	0.024	0.021	0.033	0.026	0.020
Fuel Cons.,	ℓ/100 km	10.4	9.7	9.6	9.8	9.7	9.7	9.9	9.8	9.9	9.6	9.5

WITH TRAP DIVIDED BY WITHOUT TRAP

	0	8000	16000	24000	32000	40000	48000	56000	64000	72000	80000
Hydrocarbons	0.73	0.64	0.67	0.67	0.88	0.61	0.78	0.53	0.67	0.45	0.68
Carbon Monoxide	1.00	0.94	1.00	1.03	1.00	1.02	1.03	1.00	1.08	0.99	0.91
Oxides of Nitrogen	1.00	0.93	0.96	0.96	0.96	0.91	1.03	1.03	0.87	0.97	1.01
Particulates	0.10	0.10	0.10	0.11	0.10	0.13	0.09	0.08	0.13	0.10	0.07
Fuel Cons.	1.03	0.98	1.00	1.01	1.00	0.98	1.02	1.01	1.02	1.02	1.01

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[a] Different CVS, a cleaned tunnel, and a new charcoal filter were utilized

TABLE 29. FTP RESULTS FOR CORNING TRAP DURABILITY

	Emissions in g/km				Fuel,
	HC	CO	NO_x	Part.	ℓ/100 km
Average					
Without Trap	0.10	0.61	0.96	0.28	9.7
With Trap	0.07	0.61	0.92	0.027	9.8
Standard Deviation					
Without Trap	0.01	0.02	0.05	0.04	0.2
With Trap	0.01	0.02	0.06	0.004	0.2
Ratio					
With/Without	70%	100%	96%	10%	101%

With the trap, particulate emissions were reduced by ninety percent and HC by thirty percent. Effects of the trap on CO, NO_x and fuel consumption were relatively minor.

The calculated particulate deterioration factor was 0.82 with the trap and 1.09 without the trap. By omitting the data point at 56,000 kilometers, a data point that appeared somewhat out of line relative to the other data, the deterioration factor without the trap installed would be 1.02. With the trap, the deterioration remained significantly below a value of 1, even with omission of any one data point. It appears that some relatively minor improvement in trapping efficiency actually did occur during the durability period.

No unscheduled maintenance was performed on the engine or the trap throughout the 80,000 kilometers of service accumulation, following the actual start of trap durability.

E. NGK Particulate Trap

NGK cellular, monolithic, ceramic substrates (DHC-101, 5.66x12, 12 mil/200 cpsi) were obtained from NGK-Locke, Inc. for durability evaluation. With the exception of having twice as many cells per unit of cross-sectional area, this trap substrate is very similar to the Corning substrate. This ceramic substrate was installed into a trap container using the same procedure that was used for the Corning substrate. This procedure has been described in the previous section of this report.

Preliminary evaluations, using the orifice to increase exhaust backpressure, indicated that the combined usage of a particulate trap and EGR could result in operational difficulties. When simulating the backpressure of a trap loaded to maximum capacity with particulate, driveability was affected. With the Datsun EGR system, the rate of EGR should be essentially proportional to the square root of the exhaust backpressure.

The collection rate of particulate and the increase in exhaust backpressure per unit of particulate collected, however, were such that appreciable vehicle operation could be accumulated without significantly affecting the operation of the Datsun. Therefore, the decision was reached to leave the EGR system operable for the durability evaluation.

A regeneration technique for use with the 1982 Datsun Diesel Maxima was then developed. As with the Mercedes, the regeneration involved throttling of the intake air at a speed of approximately 100 kilometers per hour.

Operational criteria for regeneration were initially established, using an orifice plate to simulate the exhaust backpressure expected to occur with a trap, prior to installing the actual trap. In the initial attempt to regenerate the trap, however, uncontrolled combustion occurred within the trap and a partial meltdown resulted. Therefore, additional development using trap simulation was again performed before another regeneration attempt was conducted on the other available trap substrate. The second regeneration attempt went smoothly and resulted in reasonably good regeneration of the trap. After several regenerations, the technique was considered to be sufficiently developed to initiate baseline testing and service accumulation.

The destructive regeneration that occurred was the second destructive regeneration experienced in this project; the initial one being with a trap from Johnson Matthey. It might be worthwhile to point out that both destructive regenerations in this project occurred during initial regeneration attempts. The likelihood of a destrictive regeneration appears to be a function of the extent of the development of the regeneration technique; the type of trap does not appear to be as important a factor. An unsuccessful, or only partially successful, regeneration attempt appears to increase the likelihood of a destructive regeneration, since the subsequent regeneration appears to become more difficult to initiate an more difficult to control.

With the two destructive regenerations experienced in this project, control of the regeneration process could not be regained once it was lost. The time factor involved has been too short. Also, as previously stated, in both cases the destructive regenerations occurred during the initial attempts toward development of a regeneration technique. It has been found possible to incorporate safeguards into the regeneration process, once it has been developed into a functional procedure.

Several factors made regeneration somewhat difficult with the Datsun. This car has a temperature-controlled cooling fan. When this cooling fan came on, the overall operating conditions during regeneration were greatly affected. This difficulty was overcome by operating the car until the cooling fan came on before starting the regeneration cycle. On this car, the rack setting was very sensitive near maximum fuel rack. An almost infinitesimal increase in fuel rack resulted in a decrease in the exhaust oxygen concentration from four down to as low as one percent. Operation for even short periods at one percent exhaust oxygen would result in setting up a condition within the trap that is conducive to subsequent rapid burning of the particulate, which produces high temperatures. This difficulty was overcome by careful adherence to a precise regeneration procedure.

Following baseline emissions evaluations, distance accumulation of the Datsun with the NGK trap was initiated. The trap was regenerated each eight hours of operation on the road. This involved a distance of about 320 kilometers, during which the pressure drop across the trap about doubled

The results of the initial emissions tests are summarized as follows:

	Zero km	Emissions, g/km			Fuel
	HC	CO	NO_x	Part.	ℓ/100 km
Without Trap	0.20	0.76	0.62	0.171	8.79
	0.19	0.74	0.63	0.158	8.64
	0.20	0.75	0.63	01.65	8.72
With Trap	0.18	0.77	0.62	0.033	8.93
	0.18	0.71	0.62	0.040	8.98
	0.18	0.74	0.62	0.037	8.96

The results, without the trap installed, agree reasonably well with the reported results for certification vehicles. Only HC is above or below the range of the values reported for two certification vehicles. HC for the car tested in this program is abour one and one-half times the HC values for the certification vehicles. With the trap, particulate emissions decreased by about eighty percent, and fuel consumption appeared to increase about two percent. The trap did not appear to have a significant effect on HC, CO or NO_x emissions.

The initial pressure drop across this trap at a vehicle speed of 64 kilometers per hour was about 1.5 kPa (6 inches of water). The stabilized post regeneration pressure drop, after several regeneration cycles, was about 2 kPa (8 inches of water).

Eight thousand kilometers (5000 miles) of operation was accumulated on the Datsun with the NGK trap. Results of the emissions evaluation at zero and 8000 kilometers of distance accumulation are summarized in Table 30.

The particulate emission rate after 8000 kilometers with the trap was about double the initial particulate emission rate. No such drastic changes occurred with the other emissions.

TABLE 30. NGK-DATSUN DURABILITY EMISSIONS

	km Accum.	Emissions, g/km			
		HC	CO	NO_x	Part.
Without Trap	0	0.20	0.75	0.63	0.165
Without Trap	8000	0.21	0.75	0.61	0.141
With Trap	0	0.18	0.74	0.62	0.037
With Trap	8000	0.22	0.84	0.54	0.081

Some apparent, but not immediately definite, decrease in pressure drop had occurred between 3000 and 5000 kilometers of distance accumulation. It appears to have occurred following a regeneration in which a trap exit temperature of 815°C (1500°F) occurred. The rate of temperature rise, although more rapid than normal, was not considered to be excessive. It should be pointed out that a fast-response temperature measurement system was used, resulting in accurate readings of the exhaust gas temperatures at the trap inlet and outlet. Temperatures within the trap and temperature stratification across the trap, however, could differ significantly from the bulk exhaust gas temperature. Visual examination indicated that some internal problem was apparently present in this trap. On the exit of the substrate some of the cells were blackened. This indicated some bypassing had occurred. Visual examination and probing of the substrate cells, however, did not enable determination of the specific cause(s) for the increase in particulate emissions. The trap assembly was x-rayed. This x-ray indicated, but did not clearly show, the presence of a radial crack in the ceramic substrate.

To assure that exhaust was not bypassing aroung the trap, the end cap of the trap container was removed to enable examination of the assembly. The substrate was still snug in the container and all insulation appeared to have remained in place. Using a new gasket, the container end cap was replaced and a single emissions evaluation was conducted. The results are summarized, along with previous results, as follows:

	Emissions in g/km		
	Initial	8000 km	Post Exam.
HC	0.18	0.22	0.24
CO	0.74	0.84	0.84
NO_x	0.62	0.54	0.61
Part.	0.037	0.081	0.052

Particulate emissions decreased relative to the value at 8000 kilometers, but were still significantly greater than the initial value. If a radial crack were present in the substrate, the axial pressure of reassembly could have reduced the width of such a crack.

The NGK trap was then removed from the container, and it was found that the trap substrate had cracked into two pieces. The radial crack occurred at a point nearly halfway between the entrance and exit of the trap substrate. No visual or physical signs of excessive overtemperature were apparent. This trap was subsequently returned to NGK for evaluation. A representative from NGK, on the basis of the visual appearance of the crack, indicated that thermal stressing was the probable cause for failure

A feature of this trap substrate, as received, was multiple surface cracks on the outside diameter of the substrate. From classical "strength of materials," it is known that cracks can contribute to the failure rate of materials in many applications. However, it is not known whether surface cracks have a significant effect on the durability of monolithic ceramic trap substrates.

Due to limitations in the level of effort available, no further durability evaluation of the NGK trap could be performed.

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APPENDICES

A. GENERAL INFORMATION
B. COMPUTER PRINTOUTS OF THE BASELINE TESTS
C. PARTICULATE CONTROL SCREENING EVALUATIONS WITH THE MERCEDES
D. PARTICULATE CONTROL SCREENING EVALUATIONS WITH THE OLDSMOBILE
E. PARTICULATE CONTROL SCREENING EVALUATIONS WITH THE VOLKSWAGEN
F. WATER INJECTION EVALUATIONS WITH A 1981 MERCEDES
G. DURABILITY OF CORNING TRAP ON THE MERCEDES
H. DURABILITY EVALUATION OF NGK TRAP ON THE DATSUN

APPENDIX A

GENERAL INFORMATION

APPENDIX A-1

DESCRIPTION OF THE 1981 MERCEDES 300SD WITH WATER INJECTION

Information As-Recived from Mercedes-Benz

Model 300 SD   1981   126.120-12-000 501
VIN WDBCB 20 A7BB 000 501
Engine family BMB3.0D9JB 3 modified to water injection
Exempt status from EPA. Effective data of exemption Dec. 9, 1980

5 cylinder indirect injection diesel engine

prechamber

EGR

Net hp-rpm	120/4350
Net torque/rpm	170 ft.lb./2400
CID	183 (3.0ℓ)
C.R.	21
Maximum engine speed	4600
Transmission	A4
Rear axle ratio	3.07
Tire size	195/70 SR 14
N.V ratio	44.8
Road load hp	11.5 (w A/C)
Fuel tank capacity	20.3
IW Class	4000
ETW	4000
Curb weight	3822 (without water injection equipment)

APPENDIX A-2

EFFECT OF TEST CELL HUMIDITY ON NO_x CORRECTION FACTOR WHEN WATER INJECTION IS USED

To illustrate the effect of test cell humidity, the NO_x humidity correction factor for certification is used. This factor is as follows:

$$K_H = 1/[1 - 0.0047 \times (H - 75)]$$

Where: H = Humidity in grains/pound of air

Assumptions and simplified calculations are utilized in the following illustration. This example, however, should suffice in showing that ambient humidity can be an important factor:

> Using water injection at a rate of 53 percent of the fuel flow, and assuming an average composite air/fuel ratio of 50, the added humidity is equal to about 75 grains per pound of air:
>
> $$\text{Added } H \approx 7000 \times 0.53/50 \approx 75 \text{ grains/pound of air}$$
>
> The humidity correction factor, the relative NO_x values and the resultant NO_x with 75 grains of water injection (per lb intake air) are summarized as follows:

Humidity (H), Grains/lb of Air	Humidity Correction Factor K_H	Relative Actual NO_x Value	Resultant NO_x with 75 Grains of Water Added Into Intake*
0	0.74	1.35	0.74
25	0.81	1.24	0.71
50	0.89	1.12	0.68
75	1.00	1.00	0.65
100	1.13	0.88	0.60
125	1.31	0.77	--
150	1.54	0.65	--
175	1.89	0.53	--

---

*Relative NO_x at H_{total} times K_H at H of the test cell

These calculated values illustrate that, as the ambient humidity increases, the same amount of water injection appears to become more effective. For example, when 75 grains of water per pound of air is added by water injection, the calculated NO_x reduction is 32 percent at a test cell humidity of 50 grains and 40 percent at 100 grains.

APPENDIX B

COMPUTER PRINTOUTS OF THE BASELINE TESTS

Pages	Description	Test Series
B-2 through B-4	Mercedes Baseline	61BL
B-5 through B-7	Oldsmobile Baseline	62BL
B-8 through B-10	VW Rabbit Baseline	63BL
B-11 through B-13	Mercedes Tuned-Up	61TU
B-14 through B-16	Oldsmobile Tuned-Up	62TU
B-17 through B-20	VW Rabbit Tuned-Up	63TU

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                                           FTP    VEHICLE EMISSIONS RESULTS
                                                   PROJECT 11-5810-001

TEST NO.   61BL-1   RUN                        VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   79 MERCEDES  BENZ              DATE     4/16/80                     ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                     BAG CART NO.  1                      DIESEL     EM-408-F
TRANSMISSION A3                                DYNO NO.      2                      ODOMETER  6474. KM( 4023. MILES)
                                               CVS NO.   3

BAROMETER 743.71 MM HG(29.28 IN HG)            DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  38. PCT                     ABS. HUMIDITY  7.5 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .90
BAG RESULTS
  BAG NUMBER                                        1              2              3
  DESCRIPTION                                COLD TRANSIENT    STABILIZED     HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              698.5 (27.5)     698.5 (27.5)     698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)            558.8 (22.0)     558.8 (22.0)     558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           37.8 (100.0)     35.0 ( 95.0)     36.7 ( 98.0)
  BLOWER REVOLUTIONS                            13965.           23713.           13880.
  TOT FLOW STD. CU. METRES(SCF)              135.9 ( 4797.)   231.9 ( 8190.)   135.8 ( 4794.)
  HC  SAMPLE METER/RANGE/PPM                 15.2/11/  15.    10.0/11/  10.     7.5/11/   7.
  HC  BCKGRD METER/RANGE/PPM                  4.4/ 1/   4.     3.5/ 1/   4.     3.5/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                 24.3/13/  22.    15.3/13/  14.    19.5/13/  17.
  CO  BCKGRD METER/RANGE/PPM                   .9/13/   1.      .9/13/   1.      .6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                 43.0/ 3/  .73    25.2/ 3/  .41    36.6/ 3/  .61
  CO2 BCKGRD METER/RANGE/PCT                  2.6/ 3/  .04     2.6/ 3/  .04     2.6/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                 25.0/ 2/  25.    15.7/ 2/  16.    25.9/ 2/  26.
  NOX BCKGRD METER/RANGE/PPM                   .3/ 2/   0.      .4/ 2/   0.      .4/ 2/   0.
  DILUTION FACTOR                               18.17            32.41            21.70
  HC  CONCENTRATION PPM                         11.               7.               4.
  CO  CONCENTRATION PPM                         20.              12.              16.
  CO2 CONCENTRATION PCT                          .70              .37              .58
  NOX CONCENTRATION PPM                         24.7             15.3             25.5
  HC  MASS GRAMS                                  .87              .88              .32
  CO  MASS GRAMS                                 3.23             3.37             2.59
  CO2 MASS GRAMS                              1731.8           1582.1           1434.3
  NOX MASS GRAMS                                 5.80             6.13             5.98
  PARTICULATE MASS GRAMS                         1.41             1.22             1.22

  HC  GRAMS/KM                                    .15              .14              .06
  CO  GRAMS/KM                                    .56              .54              .45
  CO2 GRAMS/KM                                 301.8            255.2            249.3
  NOX GRAMS/KM                                   1.01              .99             1.04
  FUEL CONSUMPTION BY CB L/100KM                11.28             9.54             9.31
  RUN TIME              SECONDS                506.             867.             506.
  MEASURED DISTANCE     KM                       5.74             6.20             5.75

COMPOSITE RESULTS                                                                             3-BAG      (4-BAG)
  TEST NUMBER          61BL-1                           CARBON DIOXIDE       G/KM          263.2      (   0.0)
  BAROMETER     MM HG  743.7                            FUEL CONSUMPTION     L/100KM         9.84     (   0.00)
  HUMIDITY      G/KG     7.5                            HYDROCARBONS (THC)   G/KM             .12     (   0.00)
  TEMPERATURE   DEG C   24.4                            CARBON MONOXIDE      G/KM             .52     (   0.00)
                                                        OXIDES OF NITROGEN   G/KM            1.01     (   0.00)
                                                        PARTICULATES         G/KM             .211    ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS
                                           PROJECT 11-5810-001

TEST NO.   61BL-2   RUN                    VEHICLE NO.61                     TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   79 MERCEDES  BENZ          DATE    4/17/80                   ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                 BAG CART NO.  1                   DIESEL     EM-408-F
TRANSMISSION A3                            DYNO NO.      2                   ODOMETER  6508. KM( 4044. MILES)
                                           CVS NO.   3

BAROMETER 747.78 MM HG(29.44 IN HG)        DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)
RELATIVE HUMIDITY  56. PCT                 ABS. HUMIDITY  9.2 GM/KG          NOX HUMIDITY CORRECTION FACTOR   .95
BAG RESULTS
  BAG NUMBER                                    1                  2                  3
  DESCRIPTION                             COLD TRANSIENT      STABILIZED       HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)           698.5 (27.5)       698.5 (27.5)       698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)         558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)        37.2 ( 99.0)       35.0 ( 95.0)       36.1 ( 97.0)
  BLOWER REVOLUTIONS                         13896.             23794.             13854.
  TOT FLOW STD. CU. METRES(SCF)           136.7 ( 4828.)     234.9 ( 8293.)     136.8 ( 4829.)
  HC  SAMPLE METER/RANGE/PPM              13.9/11/  14.       9.0/11/   9.      10.5/11/  10.
  HC  BCKGRD METER/RANGE/PPM               3.0/ 1/   3.       3.0/ 1/   3.       3.0/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM              22.2/13/  20.      13.6/13/  12.      17.8/13/  16.
  CO  BCKGRD METER/RANGE/PPM                .1/13/   0.        .1/13/   0.        .2/13/   0.
  CO2 SAMPLE METER/RANGE/PCT              42.1/ 3/  .72      25.0/ 3/  .41      37.1/ 3/  .62
  CO2 BCKGRD METER/RANGE/PCT               2.8/ 3/  .04       2.6/ 3/  .04       2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM              24.3/ 2/  24.      15.4/ 2/  15.      25.0/ 2/  25.
  NOX BCKGRD METER/RANGE/PPM                .7/ 2/   1.        .6/ 2/   1.        .6/ 2/   1.
  DILUTION FACTOR                            18.61              32.71              21.38
  HC  CONCENTRATION PPM                      11.                 6.                 8.
  CO  CONCENTRATION PPM                      19.                12.                15.
  CO2 CONCENTRATION PCT                      .68                .37                .59
  NOX CONCENTRATION PPM                     23.6               14.8               24.4
  HC  MASS GRAMS                             .87                .83                .60
  CO  MASS GRAMS                            3.04               3.17               2.41
  CO2 MASS GRAMS                          1693.1             1587.0             1471.5
  NOX MASS GRAMS                            5.89               6.35               6.09
  PARTICULATE MASS GRAMS                    1.58               1.29               1.15

  HC  GRAMS/KM                               .15                .13                .10
  CO  GRAMS/KM                               .52                .51                .41
  CO2 GRAMS/KM                             292.5              254.3              252.7
  NOX GRAMS/KM                              1.02               1.02               1.05
  FUEL CONSUMPTION BY CB L/100KM           10.93               9.50               9.44
  RUN TIME               SECONDS            507.               867.               505.
  MEASURED DISTANCE      KM                 5.79               6.24               5.82

COMPOSITE RESULTS
  TEST NUMBER              61BL-2                                            3-BAG       (4-BAG)
  BARCMETER      MM HG    747.8          CADIOXIDE        G/KM        261.8    (    0.0)
  HUMIDITY       G/KG       9.2          FUEL CONSUMPTION    L/100KM     9.78      (  0.00)
  TEMPERATURE    DEG C     21.7          HYDROCARBONS (THC)  G/KM         .13      (  0.00)
                                         CARBON MONOXIDE     G/KM         .49      (  0.00)
                                         OXIDES OF NITROGEN  G/KM        1.03      (  0.00)
                                         PARTICULATES        G/KM        .218      ( 0.000)
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                                          FTP    VEHICLE EMISSIONS RESULTS
                                                  PROJECT 11-5810-001

TEST NO.   61BL-3   RUN                          VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   79 MERCEDES  BENZ                DATE     4/22/80                     ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                       BAG CART NO.  1                      DIESEL     EM-408-F
TRANSMISSION A3                                  DYNO NO.      2                      ODOMETER  6556. KM( 4074. MILES)
                                                 CVS NO.   3

BAROMETER 740.66 MM HG(29.16 IN HG)              DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)
RELATIVE HUMIDITY  49. PCT                       ABS. HUMIDITY  8.1 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .92
BAG RESULTS
  BAG NUMBER                                           1               2                3
  DESCRIPTION                                   COLD TRANSIENT    STABILIZED      HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                 711.2 (28.0)     711.2 (28.0)     711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)               571.5 (22.5)     571.5 (22.5)     571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)              37.2 ( 99.0)     34.4 ( 94.0)     36.7 ( 98.0)
  BLOWER REVOLUTIONS                               13855.           23802.           13865.
  TOT FLOW STD. CU. METRES(SCF)                 134.8 ( 4758.)   232.5 ( 8211.)   135.0 ( 4765.)
  HC  SAMPLE METER/RANGE/PPM                    11.6/11/  12.     7.7/11/   8.     8.6/11/   9.
  HC  BCKGRD METER/RANGE/PPM                     3.5/ 1/   4.     3.5/ 1/   4.     3.5/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                    25.0/13/  22.    14.8/13/  13.    18.6/13/  16.
  CO  BCKGRD METER/RANGE/PPM                      .3/13/   0.      .3/13/   0.      .1/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                    43.4/ 3/  .74    25.2/ 3/  .41    37.0/ 3/  .62
  CO2 BCKGRD METER/RANGE/PCT                     2.9/ 3/  .04     2.9/ 3/  .04     3.0/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                    26.9/ 2/  27.    16.3/ 2/  16.    26.7/ 2/  27.
  NOX BCKGRD METER/RANGE/PPM                      .9/ 2/   1.     1.1/ 2/   1.     1.0/ 2/   1.
  DILUTION FACTOR                                   17.99            32.44            21.45
  HC  CONCENTRATION PPM                              8.               4.               5.
  CO  CONCENTRATION PPM                             21.              12.              16.
  CO2 CONCENTRATION PCT                              .70              .37              .58
  NOX CONCENTRATION PPM                             26.1             15.2             25.7
  HC  MASS GRAMS                                     .65              .58              .41
  CO  MASS GRAMS                                    3.37             3.38             2.51
  CO2 MASS GRAMS                                  1725.7           1567.1           1429.4
  NOX MASS GRAMS                                    6.17             6.23             6.11
  PARTICULATE MASS GRAMS                            1.47             1.32             1.12

  HC  GRAMS/KM                                       .11              .09              .07
  CO  GRAMS/KM                                       .58              .55              .43
  CO2 GRAMS/KM                                     298.5            253.2            247.2
  NOX GRAMS/KM                                      1.07             1.01             1.06
  FUEL CONSUMPTION BY CB L/100KM                   11.15             9.46             9.23
  RUN TIME              SECONDS                    505.             869.             505.
  MEASURED DISTANCE     KM                          5.78             6.19             5.78

COMPOSITE RESULTS                                                                                  3-BAG       (4-BAG)
  TEST NUMBER              61BL-3                             CARBON DIOXIDE        G/KM          261.0      (   0.0)
  BAROMETER       MM HG   740.7                               FUEL CONSUMPTION      L/100KM         9.75      (  0.00)
  HUMIDITY        G/KG      8.1                               HYDROCARBONS (THC)    G/KM             .09      (  0.00)
  TEMPERATURE     DEG C    21.7                               CARBON MONOXIDE       G/KM             .52      (  0.00)
                                                              OXIDES OF NITROGEN    G/KM            1.03      (  0.00)
                                                              PARTICULATES          G/KM            .216      ( 0.000)
                                          FTP    VEHICLE EMISSIONS RESULTS
                                                   PROJECT 11-5810-001

TEST NO.   62BL-1   RUN                         VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                 DATE     3/24/80                       ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                      BAG CART NO.   1                       DIESEL      EM-408-F
TRANSMISSION A3                                 DYNO NO.       2                       ODOMETER  6453. KM( 4010. MILES)
                                                CVS NO.   3

BAROMETER 737.36 MM HG(29.03 IN HG)             DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  27. PCT                      ABS. HUMIDITY  5.4 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .85
BAG RESULTS
   BAG NUMBER                                        1                  2                   3
   DESCRIPTION                                 COLD TRANSIENT       STABILIZED         HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                698.5 (27.5)       673.1 (26.5)       673.1 (26.5)
   BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             37.2 ( 99.0)       36.7 ( 98.0)       37.8 (100.0)
   BLOWER REVOLUTIONS                              13867.             23820.             13860.
   TOT FLOW STD. CU. METRES(SCF)                134.2 ( 4738.)     230.8 ( 8149.)     134.1 ( 4735.)
   HC  SAMPLE METER/RANGE/PPM                   39.9/11/  40.      21.6/11/  22.      23.4/11/  23.
   HC  BCKGRD METER/RANGE/PPM                    2.1/ 1/   2.       2.4/ 1/   2.       2.4/ 1/   2.
   CO  SAMPLE METER/RANGE/PPM                   38.2/13/  35.      22.7/13/  20.      29.0/13/  26.
   CO  BCKGRD METER/RANGE/PPM                     .1/13/   0.        .1/13/   0.        .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                   47.8/ 3/  .82      32.1/ 3/  .53      42.1/ 3/  .72
   CO2 BCKGRD METER/RANGE/PCT                    2.5/ 3/  .04       2.5/ 3/  .04       2.2/ 3/  .03
   NOX SAMPLE METER/RANGE/PPM                   18.9/ 2/  19.      14.6/ 2/  15.      18.3/ 2/  18.
   NOX BCKGRD METER/RANGE/PPM                     .8/ 2/   1.        .8/ 2/   1.        .6/ 2/   1.
   DILUTION FACTOR                                 16.10              24.94              18.56
   HC  CONCENTRATION PPM                           38.                19.                21.
   CO  CONCENTRATION PPM                           34.                20.                26.
   CO2 CONCENTRATION PCT                           .79                .50                .69
   NOX CONCENTRATION PPM                          18.1               13.8               17.7
   HC  MASS GRAMS                                 2.93               2.57               1.63
   CO  MASS GRAMS                                 5.34               5.32               3.98
   CO2 MASS GRAMS                               1938.6             2098.2             1682.2
   NOX MASS GRAMS                                 3.97               5.20               3.88
   PARTICULATE MASS GRAMS                         2.80               1.43               1.62

   HC  GRAMS/KM                                    .51                .41                .28
   CO  GRAMS/KM                                    .92                .85                .69
   CO2 GRAMS/KM                                  334.3              336.3              289.9
   NOX GRAMS/KM                                    .68                .83                .67
   FUEL CONSUMPTION BY CB L/100KM                12.55              12.61              10.86
   RUN TIME               SECONDS                505.               868.               505.
   MEASURED DISTANCE      KM                     5.80               6.24               5.80

COMPOSITE RESULTS                                                                                  3-BAG      (4-BAG)
   TEST NUMBER           62BL-1                          CARBON DIOXIDE        G/KM               323.1      (   0.0)
   BAROMETER     MM HG   737.4                           FUEL CONSUMPTION      L/100KM            12.11      (  0.00)
   HUMIDITY      G/KG      5.4                           HYDROCARBONS (THC)    G/KM                 .40      (  0.00)
   TEMPERATURE   DEG C    25.0                           CARBON MONOXIDE       G/KM                 .82      (  0.00)
                                                         OXIDES OF NITROGEN    G/KM                 .76      (  0.00)
                                                         PARTICULATES          G/KM                .295      ( 0.000)
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                                             FTP    VEHICLE EMISSIONS RESULTS
                                                      PROJECT 11-5810-001

TEST NO.   62BL-2   RUN                           VEHICLE NO.62                                      TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                   DATE    3/25/80                                    ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                        BAG CART NO.  1                                    DIESEL    EM-408-F
TRANSMISSION A3                                   DYNO NO.      2                                    ODOMETER  6479. KM( 4026. MILES)
                                                  CVS NO.   3

BAROMETER 740.16 MM HG(29.14 IN HG)               DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
RELATIVE HUMIDITY  46. PCT                        ABS. HUMIDITY  7.8 GM/KG
BAG RESULTS                                                                                          NOX HUMIDITY CORRECTION FACTOR   .91
  BAG NUMBER                                            1                    2                      3
  DESCRIPTION                                   COLD TRANSIENT          STABILIZED            HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                  698.5 (27.5)          698.5 (27.5)          698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)                558.8 (22.0)          558.8 (22.0)          558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)               36.1 ( 97.0)          37.2 ( 99.0)          36.1 ( 97.0)
  BLOWER REVOLUTIONS                               13878.                23829.                13869.
  TOT FLOW STD. CU. METRES(SCF)                  135.1 ( 4769.)        231.5 ( 8176.)        134.9 ( 4763.)
  HC  SAMPLE METER/RANGE/PPM                     42.1/11/  42.         18.2/11/  18.         24.5/11/  24.
  HC  BCKGRD METER/RANGE/PPM                      3.0/ 1/   3.          3.8/ 1/   4.          3.8/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                     42.5/13/  39.         26.0/13/  23.         32.0/13/  29.
  CO  BCKGRD METER/RANGE/PPM                       .9/13/   1.          1.0/13/   1.           .6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                     47.9/ 3/  .83         31.7/ 3/  .53         42.5/ 3/  .72
  CO2 BCKGRD METER/RANGE/PCT                      2.6/ 3/  .04          2.6/ 3/  .04          2.9/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                     17.7/ 2/  18.         13.7/ 2/  14.         17.4/ 2/  17.
  NOX BCKGRD METER/RANGE/PPM                      1.2/ 2/   1.          1.2/ 2/   1.          1.2/ 2/   1.
  DILUTION FACTOR                                    16.05                 25.28                 18.36
  HC  CONCENTRATION PPM                               39.                   15.                   21.
  CO  CONCENTRATION PPM                               37.                   22.                   28.
  CO2 CONCENTRATION PCT                               .79                   .49                   .68
  NOX CONCENTRATION PPM                              16.6                  12.5                  16.3
  HC  MASS GRAMS                                     3.06                  1.94                  1.62
  CO  MASS GRAMS                                     5.90                  5.92                  4.36
  CO2 MASS GRAMS                                   1952.1                2068.2                1685.4
  NOX MASS GRAMS                                     3.91                  5.07                  3.83
  PARTICULATE MASS GRAMS                             2.91                  1.72                  1.72

  HC  GRAMS/KM                                        .53                   .31                   .28
  CO  GRAMS/KM                                       1.02                   .95                   .75
  CO2 GRAMS/KM                                      336.5                 331.4                 290.2
  NOX GRAMS/KM                                        .67                   .81                   .66
  FUEL CONSUMPTION BY CB L/100KM                    12.64                 12.42                 10.87
  RUN TIME              SECONDS                    505.                  868.                  506.
  MEASURED DISTANCE     KM                         5.80                  6.24                  5.81

COMPOSITE RESULTS
  TEST NUMBER           62BL-2                                                                     3-BAG        (4-BAG)
  BAROMETER     MM HG    740.2                            CARBON DIOXIDE         G/KM              321.2        (    0.0)
  HUMIDITY      G/KG       7.8                            FUEL CONSUMPTION       L/100KM           12.04        (   0.00)
  TEMPERATURE   DEG C     22.2                            HYDROCARBONS (THC)     G/KM                .35        (   0.00)
                                                          CARBON MONOXIDE        G/KM                .91        (   0.00)
                                                          OXIDES OF NITROGEN     G/KM                .74        (   0.00)
                                                          PARTICULATES           G/KM               .328        (  0.000)
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                                               FTP    VEHICLE EMISSIONS RESULTS
                                                        PROJECT 11-5810-001

TEST NO.   62BL-3   RUN                             VEHICLE NO.62                             TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                     DATE     3/26/80                          ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) L-5                          BAG CART NO.  1                           DIESEL     EM-408-F
TRANSMISSION A3                                     DYNO NO.      2                           ODOMETER  6503. KM( 4041. MILES)
                                                    CVS NO.   3

BAROMETER 739.39 MM HG(29.11 IN HG)                 DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
RELATIVE HUMIDITY  51. PCT                          ABS. HUMIDITY  9.3 GM/KG                  NOX HUMIDITY CORRECTION FACTOR   .96
BAG RESULTS
   BAG NUMBER                                           1                   2                    3
   DESCRIPTION                                    COLD TRANSIENT        STABILIZED         HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                  713.7 (28.1)        713.7 (28.1)        713.7 (28.1)
   BLOWER INLET P MM. H2O(IN. H2O)                566.4 (22.3)        566.4 (22.3)        566.4 (22.3)
   BLOWER INLET TEMP. DEG. C(DEG. F)               37.8 (100.0)        38.3 (101.0)        38 3 (101.0)
   BLOWER REVOLUTIONS                                13860.              23829.              13872.
   TOT FLOW STD. CU. METRES(SCF)                  134.5 ( 4748.)      230.9 ( 8152.)      134.4 ( 4747.)
   HC  SAMPLE METER/RANGE/PPM                     49.1/11/  49.       24.7/11/  25.       23.7/11/  24.
   HC  BCKGRD METER/RANGE/PPM                      3.5/ 1/   4.        4.0/ 1/   4.        4.0/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                     42.1/13/  39.       25.9/13/  23.       30.4/13/  28.
   CO  BCKGRD METER/RANGE/PPM                       .3/13/   0.         .5/13/   0.         .7/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                     49.6/ 3/  .86       32.2/ 3/  .54       43.1/ 3/  .74
   CO2 BCKGRD METER/RANGE/PCT                      2.3/ 3/  .04        2.6/ 3/  .04        2.6/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                     16.8/ 2/  17.       12.9/ 2/  13.       17.0/ 2/  17.
   NOX BCKGRD METER/RANGE/PPM                       .8/ 2/   1.         .3/ 2/   0.         .9/ 2/   1.
   DILUTION FACTOR                                    15.44               24.83               18.09
   HC  CONCENTRATION PPM                              46.                 21.                 20.
   CO  CONCENTRATION PPM                              38.                 22.                 26.
   CO2 CONCENTRATION PCT                              .83                 .50                 .70
   NOX CONCENTRATION PPM                              16.1                12.6                16.1
   HC  MASS GRAMS                                     3.55                2.77                1.55
   CO  MASS GRAMS                                     5.87                5.97                4.09
   CO2 MASS GRAMS                                   2034.8              2100.3              1718.5
   NOX MASS GRAMS                                     3.95                5.32                3.97
   PARTICULATE MASS GRAMS                             3.47                1.67                1.50

   HC  GRAMS/KM                                        .61                 .44                 .27
   CO  GRAMS/KM                                       1.01                 .95                 .71
   CO2 GRAMS/KM                                      350.3               335.3               296.6
   NOX GRAMS/KM                                        .68                 .85                 .69
   FUEL CONSUMPTION BY CB L/100KM                    13.16               12.58               11.11
   RUN TIME              SECONDS                    505.                868.                505.
   MEASURED DISTANCE     KM                         5.81                6.26                5.79

COMPOSITE RESULTS                                                                                   3-BAG       (4-BAG)
   TEST NUMBER            62BL-3                                       CARBON DIOXIDE       G/KM      327.8      (   0.0)
   BAROMETER      MM HG   739.4                                        FUEL CONSUMPTION     L/100KM   12.30      (  0.00)
   HUMIDITY       G/KG      9.3                                        HYDROCARBONS (THC)   G/KM        .43      (  0.00)
   TEMPERATURE    DEG C    23.3                                        CARBON MONOXIDE      G/KM        .90      (  0.00)
                                                                       OXIDES OF NITROGEN   G/KM        .77      (  0.00)
                                                                       PARTICULATES         G/KM       .333      ( 0.000)
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                                             FTP    VEHICLE EMISSIONS RESULTS
                                                     PROJECT 11-5810-001

TEST NO.   63BL-1   RUN                       VEHICLE NO.63                          TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT                  DATE     3/24/80                       ACTUAL ROAD LOAD    5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4                    BAG CART NO.  1                        DIESEL    EM-408-F
TRANSMISSION M4                               DYNO NO.      2                        ODOMETER  6441. KM( 4002. MILES)
                                              CVS NO.   3

BAROMETER 739.90 MM HG(29.13 IN HG)           DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  21. PCT                    ABS. HUMIDITY  4.2 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .82
BAG RESULTS
  BAG NUMBER                                        1                   2                   3
  DESCRIPTION                                COLD TRANSIENT        STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               698.5 (27.5)        698.5 (27.5)        698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)             558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            35.0 ( 95.0)        36.1 ( 97.0)        36.7 ( 98.0)
  BLOWER REVOLUTIONS                             13854.              23816.              13843.
  TOT FLOW STD. CU. METRES(SCF)               106.3 ( 3754.)      182.3 ( 6439.)      105.9 ( 3739.)
  HC  SAMPLE METER/RANGE/PPM                  17.1/11/  17.        9.7/11/  10.       15.8/11/  16.
  HC  BCKGRD METER/RANGE/PPM                   3.8/ 1/   4.        2.8/ 1/   3.        2.8/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                  33.4/13/  30.       17.7/13/  16.       29.5/13/  27.
  CO  BCKGRD METER/RANGE/PPM                    .1/13/   0.         .1/13/   0.         .2/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                  36.2/ 3/  .61       23.0/ 3/  .37       30.9/ 3/  .51
  CO2 BCKGRD METER/RANGE/PCT                   3.2/ 3/  .05        3.1/ 3/  .05        2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                  24.4/ 2/  24.       17.4/ 2/  17.       23.6/ 2/  24.
  NOX BCKGRD METER/RANGE/PPM                    .6/ 2/   1.        1.0/ 2/   1.         .9/ 2/   1.
  DILUTION FACTOR                                21.88               35.69               25.97
  HC  CONCENTRATION PPM                           13.                  7.                 13.
  CO  CONCENTRATION PPM                           30.                 15.                 26.
  CO2 CONCENTRATION PCT                           .56                 .33                 .47
  NOX CONCENTRATION PPM                          23.8                16.4                22.7
  HC  MASS GRAMS                                  .82                 .73                 .80
  CO  MASS GRAMS                                 3.68                3.26                3.21
  CO2 MASS GRAMS                               1091.7              1091.1               920.8
  NOX MASS GRAMS                                 3.99                4.72                3.80
  PARTICULATE MASS GRAMS                         1.87                1.01                1.26

  HC  GRAMS/KM                                    .14                 .12                 .14
  CO  GRAMS/KM                                    .64                 .52                 .56
  CO2 GRAMS/KM                                  189.2               174.0               161.0
  NOX GRAMS/KM                                    .69                 .75                 .66
  FUEL CONSUMPTION BY CB L/100KM                 7.09                6.51                6.04
  RUN TIME          SECONDS                      505.                868.                505.
  MEASURED DISTANCE    KM                        5.77                6.27                5.72

COMPOSITE RESULTS
  TEST NUMBER            63BL-1                                                                   3-BAG       (4-BAG)
  BAROMETER     MM HG    739.9                         CARBON DIOXIDE          G/KM               173.6       (   0.0)
  HUMIDITY      G/KG       4.2                         FUEL CONSUMPTION        L/100KM             6.50       (  0.00)
  TEMPERATURE   DEG C     25.0                         HYDROCARBONS (THC)      G/KM                 .13       (  0.00)
                                                       CARBON MONOXIDE         G/KM                 .56       (  0.00)
                                                       OXIDES OF NITROGEN      G/KM                 .72       (  0.00)
                                                       PARTICULATES            G/KM                .211       ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS
                                           PROJECT 11-5810-001

TEST NO.   63BL-2   RUN
VEHICLE MODEL   80 VW RABBIT             VEHICLE NO.63                     TEST WEIGHT  1077. KG( 2375. LBS)
ENGINE 1.5 L( 90. CID) L-4               DATE    3/25/80                   ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
TRANSMISSION A3                          BAG CART NO.  1                   DIESEL     EM-408-F
                                         DYNO NO.      2                   ODOMETER  6463. KM( 4016. MILES)
                                         CVS NO.   3

BAROMETER 741.17 MM HG(29.18 IN HG)      DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)
RELATIVE HUMIDITY  49. PCT               ABS. HUMIDITY  8.0 GM/KG          NOX HUMIDITY CORRECTION FACTOR   .92
BAG RESULTS
  BAG NUMBER                                  1                 2                 3
  DESCRIPTION                           COLD TRANSIENT      STABILIZED       HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)          698.5 (27.5)       698.5 (27.5)      698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)        558.8 (22.0)       558.8 (22.0)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)       36.7 ( 98.0)       35.0 ( 95.0)      35.6 ( 96.0)
  BLOWER REVOLUTIONS                        13853.             23839.            13875.
  TOT FLOW STD. CU. METRES(SCF)          106.2 ( 3748.)     183.3 ( 6471.)    106.5 ( 3762.)
  HC  SAMPLE METER/RANGE/PPM             20.8/11/  21.      11.9/11/  12.     17.7/11/  18.
  HC  BCKGRD METER/RANGE/PPM              4.5/ 1/   5.       3.5/ 1/   4.      3.5/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM             36.6/13/  34.      20.3/13/  18.     32.8/13/  30.
  CO  BCKGRD METER/RANGE/PPM              1.5/13/   1.       1.2/13/   1.       .6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT             35.6/ 3/  .60      22.2/ 3/  .36     32.2/ 3/  .54
  CO2 BCKGRD METER/RANGE/PCT              2.6/ 3/  .04       2.7/ 3/  .04      2.6/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM             24.5/ 2/  25.      16.7/ 2/  17.     23.1/ 2/  23.
  NOX BCKGRD METER/RANGE/PPM              1.4/ 2/   1.       1.4/ 2/   1.      1.2/ 2/   1.
  DILUTION FACTOR                           22.26              37.00             24.83
  HC  CONCENTRATION PPM                     16.                 8.               14.
  CO  CONCENTRATION PPM                     31.                17.               29.
  CO2 CONCENTRATION PCT                     .56                .32               .50
  NOX CONCENTRATION PPM                    23.2               15.3              21.9
  HC  MASS GRAMS                           1.01                .89               .88
  CO  MASS GRAMS                           3.88               3.55              3.54
  CO2 MASS GRAMS                         1085.9             1070.5             969.3
  NOX MASS GRAMS                           4.32               4.94              4.11
  PARTICULATE MASS GRAMS                   1.81               1.18              1.45

  HC  GRAMS/KM                              .17                .14               .15
  CO  GRAMS/KM                              .67                .57               .61
  CO2 GRAMS/KM                            186.8              170.7             166.8
  NOX GRAMS/KM                              .74                .79               .71
  FUEL CONSUMPTION BY CB L/100KM           7.01               6.40              6.26
  RUN TIME           SECONDS               505.               868.              505.
  MEASURED DISTANCE    KM                  5.81               6.27              5.81

COMPOSITE RESULTS
  TEST NUMBER             63BL-2
  BAROMETER      MM HG     741.2                                                 3-BAG        (4-BAG)
  HUMIDITY       G/KG        8.0         CARBON DIOXIDE          G/KM            173.0        (   0.0)
  TEMPERATURE    DEG C      21.7         FUEL CONSUMPTION        L/100KM          6.49        (  0.00)
                                         HYDROCARBONS (THC)      G/KM              .15        (  0.00)
                                         CARBON MONOXIDE         G/KM              .60        (  0.00)
                                         OXIDES OF NITROGEN      G/KM              .76        (  0.00)
                                         PARTICULATES            G/KM             .230        ( 0.000)
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                              FTP    VEHICLE EMISSIONS RESULTS
                                      PROJECT 11-5810-001

TEST NO.   63BL-3   RUN                VEHICLE NO.63                         TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT           DATE     3/26/80                      ACTUAL ROAD LOAD    5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4             BAG CART NO.  1                       DIESEL    EM-408-F
TRANSMISSION A3                        DYNO NO.      2                       ODOMETER  6484. KM( 4029. MILES)
                                       CVS NO.   3

BARDMETER 739.14 MM HG(29.10 IN HG)    DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
RELATIVE HUMIDITY  50. PCT             ABS. HUMIDITY  8.9 GM/KG              NOX HUMIDITY CORRECTION FACTOR   .94
BAG RESULTS
   BAG NUMBER                                  1                  2                  3
   DESCRIPTION                          COLD TRANSIENT       STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)         711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)       558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)      35.6 ( 96.0)       35.0 ( 95.0)       38.3 (101.0)
   BLOWER REVOLUTIONS                        13864.             23836.             13853.
   TOT FLOW STD. CU. METRES(SCF)         106.1 ( 3747.)     182.7 ( 6450.)     105.5 ( 3724.)
   HC  SAMPLE METER/RANGE/PPM            22.0/11/  22.      11.8/11/  12.      19.0/11/  19.
   HC  BCKGRD METER/RANGE/PPM             4.1/ 1/   4.       3.7/ 1/   4.       3.7/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM            34.8/13/  32.      17.9/13/  16.      32.9/13/  30.
   CO  BCKGRD METER/RANGE/PPM              .7/13/   1.        .6/13/   1.        .4/13/   0.
   CO2 SAMPLE METER/RANGE/PCT            36.1/ 3/  .61      22.1/ 3/  .36      31.7/ 3/  .53
   CO2 BCKGRD METER/RANGE/PCT             2.7/ 3/  .04       2.6/ 3/  .04       2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM            22.3/ 2/  22.      14.5/ 2/  15.      21.8/ 2/  22.
   NOX BCKGRD METER/RANGE/PPM              .7/ 2/   1.        .2/ 2/   0.        .1/ 2/   0.
   DILUTION FACTOR                          21.93              37.20              25.24
   HC  CONCENTRATION PPM                    18.                 8.                15.
   CO  CONCENTRATION PPM                    30.                15.                29.
   CO2 CONCENTRATION PCT                    .57                .32                .49
   NOX CONCENTRATION PPM                    21.6               14.3               21.7
   HC  MASS GRAMS                           1.10                .87                .94
   CO  MASS GRAMS                           3.75               3.19               3.54
   CO2 MASS GRAMS                         1100.5             1066.2              944.8
   NOX MASS GRAMS                           4.14               4.71               4.13
   PARTICULATE MASS GRAMS                   1.59               1.12               1.33

   HC  GRAMS/KM                              .19                .14                .16
   CO  GRAMS/KM                              .66                .51                .61
   CO2 GRAMS/KM                            193.9              170.7              162.9
   NOX GRAMS/KM                              .73                .75                .71
   FUEL CONSUMPTION BY CB L/100KM           7.27               6.39               6.11
   RUN TIME              SECONDS            505.               868.               505.
   MEASURED DISTANCE     KM                 5.68               6.25               5.80

COMPOSITE RESULTS
   TEST NUMBER           63BL-3                                                          3-BAG       (4-BAG)
   BAROMETER     MM HG   739.1                         CARBON DIOXIDE       G/KM         173.3      (   0.0)
   HUMIDITY      G/KG      8.9                         FUEL CONSUMPTION     L/100KM       6.50      (  0.00)
   TEMPERATURE   DEG C    22.8                         HYDROCARBONS (THC)   G/KM           .16      (  0.00)
                                                       CARBON MONOXIDE      G/KM           .57      (  0.00)
                                                       OXIDES OF NITROGEN   G/KM           .74      (  0.00)
                                                       PARTICULATES         G/KM          .214      ( 0.000)
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                                     FTP    VEHICLE EMISSIONS RESULTS
                                             PROJECT 11-5810-001

TEST NO.   61TU-1   RUN                      VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   79 MERCEDES  BENZ            DATE    5/ 2/80                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                   BAG CART NO.  1                      DIESEL    EM-408-F
TRANSMISSION A3                              DYNO NO.      2                      ODOMETER  6943. KM( 4314. MILES)
                                             CVS NO.   3

BAROMETER 740.41 MM HG(29.15 IN HG)          DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
RELATIVE HUMIDITY  60. PCT                   ABS. HUMIDITY  9.6 GM/KG
BAG RESULTS                                                                       NOX HUMIDITY CORRECTION FACTOR   .96
   BAG NUMBER                                       1                 2                  3
   DESCRIPTION                               COLD TRANSIENT      STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)      711.2 (28.0)      711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)            571.5 (22.5)      571.5 (22.5)      571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           36.7 ( 98.0)      33.9 ( 93.0)      35.6 ( 96.0)
   BLOWER REVOLUTIONS                            13881.            23830.            13868.
   TOT FLOW STD. CU. METRES(SCF)              134.7 ( 4758.)    232.4 ( 8205.)    134.9 ( 4762.)
   HC  SAMPLE METER/RANGE/PPM                 13.1/11/  13.      8.2/11/   8.      8.5/11/   9.
   HC  BCKGRD METER/RANGE/PPM                  3.0/ 1/   3.      2.8/ 1/   3.      2.8/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM                 26.3/13/  24.     15.4/13/  14.     19.8/13/  18.
   CO  BCKGRD METER/RANGE/PPM                   .4/13/   0.       .3/13/   0.       .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                 44.5/ 3/  .76     25.7/ 3/  .42     38.0/ 3/  .64
   CO2 BCKGRD METER/RANGE/PCT                  2.8/ 3/  .04      2.6/ 3/  .04      2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                 25.2/ 2/  25.     15.2/ 2/  15.     25.3/ 2/  25.
   NOX BCKGRD METER/RANGE/PPM                   .2/ 2/   0.       .1/ 2/   0.       .2/ 2/   0.
   DILUTION FACTOR                                17.50             31.76             20.83
   HC  CONCENTRATION PPM                          10.                6.                6.
   CO  CONCENTRATION PPM                          23.               13.               17.
   CO2 CONCENTRATION PCT                           .72               .38               .60
   NOX CONCENTRATION PPM                          25.0              15.1              25.1
   HC  MASS GRAMS                                  .80               .74               .46
   CO  MASS GRAMS                                 3.53              3.51              2.66
   CO2 MASS GRAMS                               1780.4            1622.2            1485.0
   NOX MASS GRAMS                                 6.21              6.47              6.25
   PARTICULATE MASS GRAMS                         1.61              1.30              1.27

   HC  GRAMS/KM                                    .14               .12               .08
   CO  GRAMS/KM                                    .61               .56               .46
   CO2 GRAMS/KM                                  306.7             260.7             257.0
   NOX GRAMS/KM                                   1.07              1.04              1.08
   FUEL CONSUMPTION BY CB L/100KM                11.46              9.74              9.59
   RUN TIME             SECONDS                  506.              868.              505.
   MEASURED DISTANCE    KM                        5.81              6.22              5.78
COMPOSITE RESULTS
   TEST NUMBER          61TU-1                                                            3-BAG      (4-BAG)
   BAROMETER    MM HG   740.4                       CARBON DIOXIDE        G/KM            269.2     (   0.0)
   HUMIDITY     G/KG      9.6                       FUEL CONSUMPTION      L/100KM          10.06    (  0.00)
   TEMPERATURE  DEG C    21.1                       HYDROCARBONS (THC)    G/KM               .11    (  0.00)
                                                    CARBON MONOXIDE       G/KM               .54    (  0.00)
                                                    OXIDES OF NITROGEN    G/KM              1.06    (  0.00)
                                                    PARTICULATES          G/KM              .226    ( 0.000)
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                                 FTP    VEHICLE EMISSIONS RESULTS
                                          PROJECT 11-5818-001

TEST NO.   61TU-2   RUN
VEHICLE MODEL   79 MERCEDES  BENZ       VEHICLE NO.61                   TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) I-5              DATE     5/ 5/80                ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
TRANSMISSION A3                         BAG CART NO.  1                 DIESEL    EM-408-F
                                        DYNO NO.      2                 ODOMETER  6980. KM( 4337. MILES)
                                        CVS NO.   3

BAROMETER 739.65 MM HG(29.12 IN HG)     DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  38. PCT              ABS. HUMIDITY  7.1 GM/KG        NOX HUMIDITY CORRECTION FACTOR   .89
BAG RESULTS
  BAG NUMBER                                  1                 2                 3
  DESCRIPTION                          COLD TRANSIENT      STABILIZED       HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)         698.5 (27.5)      698.5 (27.5)      698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)       558.8 (22.0)      558.8 (22.0)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)      36.7 ( 98.0)      35.6 ( 96.0)      36.1 ( 97.0)
  BLOWER REVOLUTIONS                       13879.            23764.            13876.
  TOT FLOW STD. CU. METRES(SCF)         134.9 ( 4765.)    231.4 ( 8172.)    135.0 ( 4767.)
  HC  SAMPLE METER/RANGE/PPM            11.3/11/  11.      7.5/11/   8.      7.6/11/   8.
  HC  BCKGRD METER/RANGE/PPM             2.7/ 1/   3.      2.5/ 1/   3.      2.5/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM            23.8/13/  21.     13.9/13/  12.     17.8/13/  16.
  CO  BCKGRD METER/RANGE/PPM              .4/13/   0.       .3/13/   0.       .2/13/   0.
  CO2 SAMPLE METER/RANGE/PCT            46.6/ 3/  .80     27.8/ 3/  .46     38.6/ 3/  .65
  CO2 BCKGRD METER/RANGE/PCT             3.1/ 3/  .05      3.3/ 3/  .05      3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM            28.8/ 2/  29.     17.7/ 2/  18.     28.4/ 2/  28.
  NOX BCKGRD METER/RANGE/PPM             1.1/ 2/   1.      1.2/ 2/   1.      1.2/ 2/   1.
  DILUTION FACTOR                          16.64             29.22             20.49
  HC  CONCENTRATION PPM                     9.                5.                5.
  CO  CONCENTRATION PPM                    20.               12.               15.
  CO2 CONCENTRATION PCT                     .76               .41               .61
  NOX CONCENTRATION PPM                    27.8              16.5              27.3
  HC  MASS GRAMS                             .68               .69               .41
  CO  MASS GRAMS                            3.20              3.16              2.39
  CO2 MASS GRAMS                         1871.0            1728.1            1499.4
  NOX MASS GRAMS                            6.41              6.55              6.29
  PARTICULATE MASS GRAMS                    1.08              1.39              1.26

  HC  GRAMS/KM                               .12               .11               .07
  CO  GRAMS/KM                               .55               .51               .41
  CO2 GRAMS/KM                            322.1             276.4             258.3
  NOX GRAMS/KM                              1.10              1.05              1.08
  FUEL CONSUMPTION BY CB L/100KM           12.03             10.32              9.64
  RUN TIME               SECONDS          506.              866.              506.
  MEASURED DISTANCE      KM                5.81              6.25              5.80

COMPOSITE RESULTS
  TEST NUMBER            61TU-2
  BAROMETER      MM HG   739.6                                                     3-BAG       (4-BAG)
  HUMIDITY       G/KG      7.1                     CARBON DIOXIDE        G/KM       280.9       (   0.0)
  TEMPERATURE    DEG C    23.9                     FUEL CONSUMPTION      L/100KM     10.49      (  0.00)
                                                   HYDROCARBONS (THC)    G/KM          .10      (  0.00)
                                                   CARBON MONOXIDE       G/KM          .49      (  0.00)
                                                   OXIDES OF NITROGEN    G/KM         1.07      (  0.00)
                                                   PARTICULATES          G/KM          .213     ( 0.000)
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                                    FTP    VEHICLE EMISSIONS RESULTS
                                             PROJECT 11-5810-001

TEST NO.   61TU-3   RUN                      VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   79 MERCEDES  BENZ            DATE    5/ 6/80                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                   BAG CART NO.  1                      DIESEL     EM-408-F
TRANSMISSION A3                              DYNO NO.      2                      ODOMETER  6997. KM( 4348. MILES)
                                             CVS NO.   3

BAROMETER 738.63 MM HG(29.08 IN HG)          DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
RELATIVE HUMIDITY  60. PCT                   ABS. HUMIDITY  9.6 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .97
BAG RESULTS
  BAG NUMBER                                    1                 2                  3
  DESCRIPTION                             COLD TRANSIENT      STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)           673.1 (26.5)      673.1 (26.5)      673.1 (26.5)
  BLOWER INLET P MM. H2O(IN. H2O)         558.8 (22.0)      558.8 (22.0)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)        36.1 ( 97.0)      34.4 ( 94.0)      36.1 ( 97.0)
  BLOWER REVOLUTIONS                          13862.            23776.            13855.
  TOT FLOW STD. CU. METRES(SCF)           134.7 ( 4757.)    231.7 ( 8181.)    134.6 ( 4754.)
  HC  SAMPLE METER/RANGE/PPM              11.1/11/  11.      7.2/11/   7.      8.0/11/   8.
  HC  BCKGRD METER/RANGE/PPM               2.3/ 1/   2.      2.8/ 1/   3.      2.8/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM              24.1/13/  22.     14.8/13/  13.     17.9/13/  16.
  CO  BCKGRD METER/RANGE/PPM                .2/13/   0.       .2/13/   0.       .1/13/   0.
  CO2 SAMPLE METER/RANGE/PCT              44.0/ 3/  .75     26.0/ 3/  .43     37.5/ 3/  .63
  CO2 BCKGRD METER/RANGE/PCT               3.0/ 3/  .05      2.5/ 3/  .04      2.3/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM              27.5/ 2/  28.     16.3/ 2/  16.     26.2/ 2/  26.
  NOX BCKGRD METER/RANGE/PPM               1.7/ 2/   2.       .8/ 2/   1.       .5/ 2/   1.
  DILUTION FACTOR                             17.73             31.38             21.14
  HC  CONCENTRATION PPM                         9.                5.                5.
  CO  CONCENTRATION PPM                        21.               13.               15.
  CO2 CONCENTRATION PCT                        .71               .39               .60
  NOX CONCENTRATION PPM                       25.9              15.5              25.7
  HC  MASS GRAMS                               .69               .60               .41
  CO  MASS GRAMS                              3.24              3.38              2.39
  CO2 MASS GRAMS                            1749.6            1646.1            1474.0
  NOX MASS GRAMS                              6.44              6.64              6.39
  PARTICULATE MASS GRAMS                      1.49              1.36              1.29

  HC  GRAMS/KM                                 .12               .10               .07
  CO  GRAMS/KM                                 .56               .55               .42
  CO2 GRAMS/KM                               304.6             268.3             256.2
  NOX GRAMS/KM                                1.12              1.08              1.11
  FUEL CONSUMPTION BY CB L/100KM             11.38             10.02              9.56
  RUN TIME          SECONDS                   505.              867.              505.
  MEASURED DISTANCE    KM                     5.74              6.14              5.75

COMPOSITE RESULTS                                                                          3-BAG       (4-BAG)
  TEST NUMBER         61TU-3                           CARBON DIOXIDE        G/KM         272.5      (   0.0)
  BAROMETER    MM HG  738.6                            FUEL CONSUMPTION      L/100KM      10.18      (  0.00)
  HUMIDITY     G/KG     9.6                            HYDROCARBONS (THC)    G/KM           .10      (  0.00)
  TEMPERATURE  DEG C   21.1                            CARBON MONOXIDE       G/KM           .52      (  0.00)
                                                       OXIDES OF NITROGEN    G/KM          1.10      (  0.00)
                                                       PARTICULATES          G/KM          .230      ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS
                                           PROJECT 11-5810-001

 TEST NO.   62TU-1   RUN   1                 VEHICLE NO.62                                TEST WEIGHT  1928. KG( 4250. LBS)
 VEHICLE MODEL   80 OLDS DELTA88             DATE     4/ 4/80                             ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
 ENGINE 5.7 L(350. CID) V-8                  BAG CART NO.   1                             DIESEL     EM-408-F
 TRANSMISSION A3                             DYNO NO.       2                             ODOMETER  6920. KM( 4300. MILES)
                                             CVS NO.   3

 BAROMETER 745.24 MM HG(29.34 IN HG)         DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
 RELATIVE HUMIDITY  40. PCT                  ABS. HUMIDITY  6.4 GM/KG                     NOX HUMIDITY CORRECTION FACTOR   .88
 BAG RESULTS
   BAG NUMBER                                      1                    2                    3
   DESCRIPTION                              COLD TRANSIENT         STABILIZED          HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            698.5 (27.5)          698.5 (27.5)         698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)          558.8 (22.0)          558.8 (22.0)         558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)         37.8 (100.0)          36.7 ( 98.0)         37.8 (100.0)
   BLOWER REVOLUTIONS                          13971.                23804.               13867.
   TOT FLOW STD. CU. METRES(SCF)            136.6 ( 4822.)        233.3 ( 8238.)       135.7 ( 4792.)
   HC  SAMPLE METER/RANGE/PPM               34.1/11/  34.         15.8/11/  16.        26.8/11/  27.
   HC  BCKGRD METER/RANGE/PPM                2.5/ 1/   3.          2.5/ 1/   3.         2.5/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM               36.5/13/  33.         19.6/13/  17.        24.1/13/  22.
   CO  BCKGRD METER/RANGE/PPM                 .1/13/   0.           .1/13/   0.          .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT               45.9/ 3/  .79         29.6/ 3/  .49        40.3/ 3/  .68
   CO2 BCKGRD METER/RANGE/PCT                2.7/ 3/  .04          2.3/ 3/  .04         2.6/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM               18.0/ 2/  18.         14.2/ 2/  14.        18.4/ 2/  18.
   NOX BCKGRD METER/RANGE/PPM                 .5/ 2/   1.           .5/ 2/   1.          .5/ 2/   1.
   DILUTION FACTOR                               16.85                 27.25                19.47
   HC  CONCENTRATION PPM                         32.                   13.                  24.
   CO  CONCENTRATION PPM                         32.                   17.                  21.
   CO2 CONCENTRATION PCT                         .75                   .45                  .65
   NOX CONCENTRATION PPM                        17.5                  13.7                 17.9
   HC  MASS GRAMS                                2.50                  1.81                 1.91
   CO  MASS GRAMS                                5.15                  4.60                 3.31
   CO2 MASS GRAMS                             1874.9                1942.1               1604.0
   NOX MASS GRAMS                                4.01                  5.36                 4.07
   PARTICULATE MASS GRAMS                        2.52                  1.39                 1.36

   HC  GRAMS/KM                                  .43                   .29                  .33
   CO  GRAMS/KM                                  .89                   .74                  .58
   CO2 GRAMS/KM                                322.1                 311.7                279.3
   NOX GRAMS/KM                                  .69                   .86                  .71
   FUEL CONSUMPTION BY CB L/100KM              12.09                 11.67                10.46
   RUN TIME               SECONDS               506.                  868.                 506.
   MEASURED DISTANCE      KM                    5.82                  6.23                 5.74

 COMPOSITE RESULTS
   TEST NUMBER             62TU-1                                                           3-BAG        (4-BAG)
   BAROMETER     MM HG      745.2                     CARBON DIOXIDE        G/KM           305.0        (   0.0)
   HUMIDITY      G/KG         6.4                     FUEL CONSUMPTION      L/100KM        11.43        (  0.00)
   TEMPERATURE   DEG C       21.1                     HYDROCARBONS (THC)    G/KM             .33        (  0.00)
                                                      CARBON MONOXIDE       G/KM             .72        (  0.00)
                                                      OXIDES OF NITROGEN    G/KM             .78        (  0.00)
                                                      PARTICULATES          G/KM            .270        ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS
                                                 PROJECT 11-5810-001

TEST NO.   62TU-2   RUN   1                  VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88              DATE    4/ 7/80                        ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                   BAG CART NO.  1                        DIESEL    EM-408-F
TRANSMISSION A3                              DYNO NO.      2                        ODOMETER  6952. KM( 4320. MILES)
                                             CVS NO.   3

BAROMETER 735.08 MM HG(28.94 IN HG)          DRY BULB TEMP. 30.0 DEG C(86.0 DEG F)
RELATIVE HUMIDITY  42. PCT                   ABS. HUMIDITY 11.6 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
   BAG NUMBER                                      1                 2                  3
   DESCRIPTION                              COLD TRANSIENT      STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             698.5 (27.5)       698.5 (27.5)       698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)           558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)          36.7 ( 98.0)       37.8 (100.0)       37.2 ( 99.0)
   BLOWER REVOLUTIONS                          13850.             23816.             13839.
   TOT FLOW STD. CU. METRES(SCF)             133.6 ( 4716.)     229.4 ( 8099.)     133.8 ( 4725.)
   HC  SAMPLE MEPER/RANGE/PPM                36.5/11/  36.      19.9/11/  20.      19.3/11/  19.
   HC  BCKGRD METER/RANGE/PPM                 3.1/ 1/   3.       3.2/ 1/   3.       3.2/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM                37.8/13/  35.      21.1/13/  19.      26.5/13/  24.
   CO  BCKGRD METER/RANGE/PPM                  .3/13/   0.        .4/13/   0.        .4/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                46.6/ 3/  .80      30.4/ 3/  .50      41.5/ 3/  .71
   CO2 BCKGRD METER/RANGE/PCT                 2.3/ 3/  .04       2.4/ 3/  .04       2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                15.0/ 2/  15.      11.3/ 2/  11.      15.2/ 2/  15.
   NOX BCKGRD METER/RANGE/PPM                  .2/ 2/   0.        .2/ 2/   0.        .3/ 2/   0.
   DILUTION FACTOR                              16.56              26.45              18.87
   HC  CONCENTRATION PPM                         34.                17.                16.
   CO  CONCENTRATION PPM                         33.                18.                23.
   CO2 CONCENTRATION PCT                          .77                .47                .67
   NOX CONCENTRATION PPM                        14.8               11.1               14.9
   HC  MASS GRAMS                                2.59               2.22               1.26
   CO  MASS GRAMS                                5.21               4.81               3.56
   CO2 MASS GRAMS                              1880.3             1963.2             1640.4
   NOX MASS GRAMS                                3.90               5.02               3.93
   PARTICULATE MASS GRAMS                        3.52               1.43               1.29

   HC  GRAMS/KM                                   .45                .36                .22
   CO  GRAMS/KM                                   .90                .78                .61
   CO2 GRAMS/KM                                 323.8              317.5              283.3
   NOX GRAMS/KM                                   .67                .81                .68
   FUEL CONSUMPTION BY CB L/100KM               12.15              11.90              10.60
   RUN TIME              SECONDS                505.               868.               504.
   MEASURED DISTANCE     KM                     5.81               6.18               5.79

COMPOSITE RESULTS
   TEST NUMBER              62TU-2                                                            3-BAG      (4-BAG)
   BAROMETER      MM HG     735.1                CARBON DIOXIDE          G/KM           309.4     (    0.0)
   HUMIDITY       G/KG       11.6                FUEL CONSUMPTION        L/100KM        11.59     (   0.00)
   TEMPERATURE    DEG C      30.0                HYDROCARBONS (THC)      G/KM             .34     (   0.00)
                                                 CARBON MONOXIDE         G/KM             .76     (   0.00)
                                                 OXIDES OF NITROGEN      G/KM             .75     (   0.00)
                                                 PARTICULATES            G/KM            .307     (  0.000)
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                                              FTP    VEHICLE EMISSIONS RESULTS
                                                      PROJECT 11-5810-001

TEST NO.    62TU-3   RUN   1                   VEHICLE NO.62                                TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                DATE     4/ 8/80                             ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) [illegible]-8           BAG CART NO.  1                              DIESEL     EM-408-F
TRANSMISSION A3                                DYNO NO.      2                              ODOMETER  6973. KM( 4333. MILES)
                                               CVS NO.   3

BAROMETER 746.51 MM HG(29.39 IN HG)            DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  13. PCT                     ABS. HUMIDITY  2.5 GM/KG                     NOX HUMIDITY CORRECTION FACTOR   .79
BAG RESULTS
   BAG NUMBER                                        1                    2                    3
   DESCRIPTION                                 COLD TRANSIENT        STABILIZED          HOT TRANSIENT           STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                698.5 (27.5)        698.5 (27.5)        698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             37.8 (100.0)        37.8 (100.0)        37.8 (100.0)
   BLOWER REVOLUTIONS                              13860.              23826.              13841.
   TOT FLOW STD. CU. METRES(SCF)                136.0 ( 4801.)      233.8 ( 8254.)      135.8 ( 4794.)
   HC  SAMPLE METER/RANGE/PPM                   31.3/11/  31.       15.6/11/  16.       15.3/11/  15.
   HC  BCKGRD METER/RANGE/PPM                    2.1/ 1/   2.        2.1/ 1/   2.        2.1/ 1/   2.
   CO  SAMPLE METER/RANGE/PPM                   35.3/13/  32.       19.9/13/  18.       24.2/13/  22.
   CO  BCKGRD METER/RANGE/PPM                     .2/13/   0.         .1/13/   0.         .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                   45.7/ 3/  .78       29.7/ 3/  .49       39.6/ 3/  .67
   CO2 BCKGRD METER/RANGE/PCT                    2.1/ 3/  .03        1.8/ 3/  .03        2.1/ 3/  .03
   NOX SAMPLE METER/RANGE/PPM                   18.6/ 2/  19.       14.4/ 2/  14.       18.5/ 2/  19.
   NOX BCKGRD METER/RANGE/PPM                     .8/ 2/   1.         .1/ 2/   0.         .2/ 2/   0.
   DILUTION FACTOR                                  16.94               27.15               19.88
   HC  CONCENTRATION PPM                            29.                 14.                 13.
   CO  CONCENTRATION PPM                            31.                 17.                 21.
   CO2 CONCENTRATION PCT                             .75                 .46                 .64
   NOX CONCENTRATION PPM                            17.8                14.3                18.3
   HC  MASS GRAMS                                    2.30                1.83                1.04
   CO  MASS GRAMS                                    4.98                4.72                3.35
   CO2 MASS GRAMS                                 1878.7              1985.3              1590.6
   NOX MASS GRAMS                                    3.65                5.03                3.74
   PARTICULATE MASS GRAMS                            2.09                1.36                1.48

   HC  GRAMS/KM                                       .40                 .29                 .18
   CO  GRAMS/KM                                       .86                 .76                 .58
   CO2 GRAMS/KM                                    323.5               317.7               273.4
   NOX GRAMS/KM                                       .63                 .81                 .64
   FUEL CONSUMPTION BY CB L/100KM                  12.13               11.90               10.22
   RUN TIME              SECONDS                   505.                868.                505.
   MEASURED DISTANCE     KM                        5.81                6.25                5.82

COMPOSITE RESULTS
   TEST NUMBER            62TU-3                                                  3-BAG         (4-BAG)
   BAROMETER     MM HG    746.5          CARBON DIOXIDE        G/KM               306.7         (   0.0)
   HUMIDITY      G/KG       2.5          FUEL CONSUMPTION      L/100KM            11.49         (  0.00)
   TEMPERATURE   DEG C     25.0          HYDROCARBONS (THC)    G/KM                 .28         (  0.00)
                                         CARBON MONOXIDE       G/KM                 .73         (  0.00)
                                         OXIDES OF NITROGEN    G/KM                 .72         (  0.00)
                                         PARTICULATES          G/KM                .258         ( 0.000)
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                                  FTP    VEHICLE EMISSIONS RESULTS
                                           PROJECT 11-5810-001

TEST NO.   63TU-1   RUN   1                VEHICLE NO.63                  TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT               DATE    4/ 4/80                ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4                 BAG CART NO.  1                DIESEL     EM-408-F
TRANSMISSION A3                            DYNO NO.      2                ODOMETER  6922. KM( 4301. MILES)
                                           CVS NO.   3

BAROMETER 746.00 MM HG(29.37 IN HG)        DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  20. PCT                 ABS. HUMIDITY  3.8 GM/KG       NOX HUMIDITY CORRECTION FACTOR   .82
BAG RESULTS
  BAG NUMBER                                    1               2               3
  DESCRIPTION                            COLD TRANSIENT     STABILIZED     HOT TRANSIENT     STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)           698.5 (27.5)     698.5 (27.5)     698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)         558.8 (22.0)     558.8 (22.0)     558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)        35.6 ( 96.0)     36.1 ( 97.0)     36.1 ( 97.0)
  BLOWER REVOLUTIONS                         13860.           23816.           13848.
  TOT FLOW STD. CU. METRES(SCF)           107.2 ( 3784.)   184.0 ( 6495.)   107.0 ( 3777.)
  HC  SAMPLE METER/RANGE/PPM              19.1/11/  19.    11.3/11/  11.    19.2/11/  19.
  HC  BCKGRD METER/RANGE/PPM               2.0/ 1/   2.     2.4/ 1/   2.     2.4/ 1/   2.
  CO  SAMPLE METER/RANGE/PPM              34.0/13/  31.    16.7/13/  15.    29.1/13/  26.
  CO  BCKGRD METER/RANGE/PPM                .1/13/   0.      .1/13/   0.      .1/13/   0.
  CO2 SAMPLE METER/RANGE/PCT              35.1/ 3/  .59    22.4/ 3/  .36    31.5/ 3/  .52
  CO2 BCKGRD METER/RANGE/PCT               2.4/ 3/  .04     2.1/ 3/  .03     2.2/ 3/  .03
  NOX SAMPLE METER/RANGE/PPM              24.8/ 2/  25.    17.0/ 2/  17.    23.8/ 2/  24.
  NOX BCKGRD METER/RANGE/PPM                .5/ 2/   1.      .3/ 2/   0.      .3/ 2/   0.
  DILUTION FACTOR                            22.62            36.69            25.43
  HC  CONCENTRATION PPM                      17.               9.              17.
  CO  CONCENTRATION PPM                      30.              14.              26.
  CO2 CONCENTRATION PCT                      .55              .33              .49
  NOX CONCENTRATION PPM                     24.3             16.7             23.5
  HC  MASS GRAMS                            1.06              .95             1.04
  CO  MASS GRAMS                            3.79             3.10             3.21
  CO2 MASS GRAMS                          1084.1           1116.3            960.0
  NOX MASS GRAMS                            4.06             4.79             3.92
  PARTICULATE MASS GRAMS                    1.74             1.15             1.29

  HC  GRAMS/KM                               .18              .15              .18
  CO  GRAMS/KM                               .65              .50              .55
  CO2 GRAMS/KM                             187.2            178.3            165.5
  NOX GRAMS/KM                               .70              .77              .68
  FUEL CONSUMPTION BY CB L/100KM            7.02             6.68             6.21
  RUN TIME               SECONDS            505.             868.             505.
  MEASURED DISTANCE      KM                 5.79             6.26             5.80

COMPOSITE RESULTS                                                                     3-BAG       (4-BAG)
  TEST NUMBER          63TU-1                        CARBON DIOXIDE      G/KM        176.6      (    0.0)
  BAROMETER    MM HG  746.0                          FUEL CONSUMPTION    L/100KM      6.62      (   0.00)
  HUMIDITY     G/KG     3.8                          HYDROCARBONS (THC)  G/KM          .17      (   0.00)
  TEMPERATURE  DEG C   24.4                          CARBON MONOXIDE     G/KM          .54      (   0.00)
                                                     OXIDES OF NITROGEN  G/KM          .73      (   0.00)
                                                     PARTICULATES        G/KM         .218      (  0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS
                                            PROJECT 11-5810-001

TEST NO.   63TU-2   RUN   1             VEHICLE NO.63                       TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT            DATE    4/ 7/80                     ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4              BAG CART NO.  1                     DIESEL    EM-408-F
TRANSMISSION M4                         DYNO NO.      2                     ODOMETER  6949. KM( 4318. MILES)
                                        CVS NO.   3

BAROMETER 734.82 MM HG(28.93 IN HG)     DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  62. PCT              ABS. HUMIDITY 12.0 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
   BAG NUMBER                                 1                 2                 3
   DESCRIPTION                         COLD TRANSIENT      STABILIZED       HOT TRANSIENT      STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)        698.5 (27.5)      698.5 (27.5)      698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)      558.8 (22.0)      558.8 (22.0)      558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)     36.1 ( 97.0)      37.2 ( 99.0)      36.7 ( 98.0)
   BLOWER REVOLUTIONS                       13863.            23845.            13839.
   TOT FLOW STD. CU. METRES(SCF)        105.4 ( 3720.)    180.9 ( 6387.)    105.1 ( 3710.)
   HC  SAMPLE METER/RANGE/PPM           22.3/11/  22.     13.5/11/  13.     19.8/11/  20.
   HC  BCKGRD METER/RANGE/PPM            3.6/ 1/   4.      3.6/ 1/   4.      3.6/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM           36.8/13/  34.     20.4/13/  18.     33.2/13/  30.
   CO  BCKGRD METER/RANGE/PPM             .7/13/   1.       .3/13/   0.       .2/13/   0.
   CO2 SAMPLE METER/RANGE/PCT           35.2/ 3/  .59     23.0/ 3/  .37     32.1/ 3/  .53
   CO2 BCKGRD METER/RANGE/PCT            2.4/ 3/  .04      2.5/ 3/  .04      2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM           20.7/ 2/  21.     14.9/ 2/  15.     21.3/ 2/  21.
   NOX BCKGRD METER/RANGE/PPM             .7/ 2/   1.       .5/ 2/   1.       .5/ 2/   1.
   DILUTION FACTOR                         22.53             35.63             24.90
   HC  CONCENTRATION PPM                     19.               10.               16.
   CO  CONCENTRATION PPM                     32.               17.               29.
   CO2 CONCENTRATION PCT                     .55               .34               .49
   NOX CONCENTRATION PPM                    20.0              14.4              20.8
   HC  MASS GRAMS                           1.14              1.04               .99
   CO  MASS GRAMS                           3.94              3.66              3.56
   CO2 MASS GRAMS                         1069.3            1112.1             949.5
   NOX MASS GRAMS                           4.21              5.20              4.36
   PARTICULATE MASS GRAMS                   1.66              1.24              1.43

   HC  GRAMS/KM                              .20               .17               .17
   CO  GRAMS/KM                              .68               .59               .61
   CO2 GRAMS/KM                            184.9             177.8             163.3
   NOX GRAMS/KM                              .73               .83               .75
   FUEL CONSUMPTION BY CB L/100KM           6.94              6.67              6.13
   RUN TIME               SECONDS           505.              868.              504.
   MEASURED DISTANCE      KM                5.78              6.26              5.82

COMPOSITE RESULTS
   TEST NUMBER              63TU-2                                                     3-BAG     (4-BAG)
   BAROMETER     MM HG      734.8                CARBON DIOXIDE       G/KM            175.3    (   0.0)
   HUMIDITY      G/KG        12.0                FUEL CONSUMPTION     L/100KM          6.58    (  0.00)
   TEMPERATURE   DEG C       23.9                HYDROCARBONS (THC)   G/KM              .17    (  0.00)
                                                 CARBON MONOXIDE      G/KM              .61    (  0.00)
                                                 OXIDES OF NITROGEN   G/KM              .79    (  0.00)
                                                 PARTICULATES         G/KM             .229    ( 0.000)
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                                          FTP    VEHICLE EMISSIONS RESULTS
                                                  PROJECT 11-5810-001
 TEST NO.   63TU-3   RUN   1                 VEHICLE NO.63                          TEST WEIGHT  1077. KG( 2375. LBS)
 VEHICLE MODEL   80 VW RABBIT                DATE    4/ 8/80                        ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
 ENGINE 1.5 L( 90. CID) L-4                  BAG CART NO.  1                        DIESEL    EM-408-F
 TRANSMISSION A3                             DYNO NO.      2                        ODOMETER  6972. KM( 4332. MILES)
                                             CVS NO.   3

 BAROMETER 747.27 MM HG(29.42 IN HG)         DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
 RELATIVE HUMIDITY  11. PCT                  ABS. HUMIDITY  2.2 GM/KG
 BAG RESULTS                                                                        NOX HUMIDITY CORRECTION FACTOR   .78
   BAG NUMBER                                     1                  2                   3
   DESCRIPTION                              COLD TRANSIENT       STABILIZED         HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             698.5 (27.5)        698.5 (27.5)        698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)           558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)          36.1 ( 97.0)        35.0 ( 95.0)        35.6 ( 96.0)
   BLOWER REVOLUTIONS                           13849.              23829.              13847.
   TOT FLOW STD. CU. METRES(SCF)             107.2 ( 3784.)      184.8 ( 6525.)      107.3 ( 3787.)
   HC  SAMPLE METER/RANGE/PPM                18.1/11/  18.       11.4/11/  11.       17.4/11/  17.
   HC  BCKGRD METER/RANGE/PPM                 3.1/ 1/   3.        2.2/ 1/   2.        2.2/ 1/   2.
   CO  SAMPLE METER/RANGE/PPM                31.1/13/  28.       16.5/13/  15.       21.0/13/  19.
   CO  BCKGRD METER/RANGE/PPM                  .3/13/   0.         .4/13/   0.         .3/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                33.6/ 3/  .56       20.9/ 3/  .34       30.2/ 3/  .50
   CO2 BCKGRD METER/RANGE/PCT                 2.2/ 3/  .03        2.4/ 3/  .04        2.1/ 3/  .03
   NOX SAMPLE METER/RANGE/PPM                25.0/ 2/  25.       17.0/ 2/  17.       23.7/ 2/  24.
   NOX BCKGRD METER/RANGE/PPM                  .5/ 2/   1.         .1/ 2/   0.         .1/ 2/   0.
   DILUTION FACTOR                              23.72               39.47               26.65
   HC  CONCENTRATION PPM                          15.                  9.                 15.
   CO  CONCENTRATION PPM                          28.                 14.                 18.
   CO2 CONCENTRATION PCT                          .53                 .30                 .47
   NOX CONCENTRATION PPM                         24.5                16.9                23.6
   HC  MASS GRAMS                                 .94                 .98                 .95
   CO  MASS GRAMS                                3.44                3.03                2.27
   CO2 MASS GRAMS                              1036.2              1019.1               919.8
   NOX MASS GRAMS                                3.92                4.67                3.78
   PARTICULATE MASS GRAMS                        1.54                1.11                1.38

   HC  GRAMS/KM                                   .16                 .16                 .16
   CO  GRAMS/KM                                   .59                 .49                 .39
   CO2 GRAMS/KM                                 179.1               163.3               159.0
   NOX GRAMS/KM                                   .68                 .75                 .65
   FUEL CONSUMPTION BY CB L/100KM                6.71                6.12                5.96
   RUN TIME              SECONDS                 505.                868.                504.
   MEASURED DISTANCE     KM                      5.79                6.24                5.79
 COMPOSITE RESULTS
   TEST NUMBER              63TU-3                                                           3-BAG       (4-BAG)
   BAROMETER      MM HG  747.3                            CARBON DIOXIDE        G/KM         165.4      (    0.0)
   HUMIDITY       G/KG     2.2                            FUEL CONSUMPTION      L/100KM       6.20      (   0.00)
   TEMPERATURE    DEG C   24.4                            HYDROCARBONS (THC)    G/KM           .16      (   0.00)
                                                          CARBON MONOXIDE       G/KM           .48      (   0.00)
                                                          OXIDES OF NITROGEN    G/KM           .71      (   0.00)
                                                          PARTICULATES          G/KM          .213      ( 0.000)
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                                              FTP    VEHICLE EMISSIONS RESULTS
                                                       PROJECT 11-5810-001

TEST NO.   63TU-4   RUN   1                         VEHICLE NO.63                                  TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT                        DATE    4/11/80                                ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4                          BAG CART NO.  1                                DIESEL     EM-408-F
TRANSMISSION M4                                     DYNO NO.      2                                ODOMETER   7327. KM( 4553. MILES)
                                                    CVS NO.   3

BAROMETER 733.30 MM HG(28.87 IN HG)                 DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  63. PCT                          ABS. HUMIDITY 12.5 GM/KG                       NOX HUMIDITY CORRECTION FACTOR  1.06
BAG RESULTS
   BAG NUMBER                                            1                    2                    3
   DESCRIPTION                                    COLD TRANSIENT         STABILIZED          HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                  698.5 (27.5)          698.5 (27.5)          698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)                558.8 (22.0)          558.8 (22.0)          558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)               36.7 ( 98.0)          37.2 ( 99.0)          36.7 ( 98.0)
   BLOWER REVOLUTIONS                                13866.                23825.                13870.
   TOT FLOW STD. CU. METRES(SCF)                  105.0 ( 3709.)        180.3 ( 6367.)        105.1 ( 3710.)
   HC  SAMPLE METER/RANGE/PPM                     21.8/11/  22.         14.6/11/  15.         21.8/11/  22.
   HC  BCKGRD METER/RANGE/PPM                      2.4/ 1/   2.          2.4/ 1/   2.          2.4/ 1/   2.
   CO  SAMPLE METER/RANGE/PPM                     32.9/13/  30.         18.2/13/  16.         30.8/13/  28.
   CO  BCKGRD METER/RANGE/PPM                       .1/13/   0.           .4/13/   0.           .4/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                     35.4/ 3/  .59         21.7/ 3/  .35         31.7/ 3/  .53
   CO2 BCKGRD METER/RANGE/PCT                      2.6/ 3/  .04          2.4/ 3/  .04          2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                     21.5/ 2/  22.         14.7/ 2/  15.         21.0/ 2/  21.
   NOX BCKGRD METER/RANGE/PPM                       .3/ 2/   0.           .3/ 2/   0.           .1/ 2/   0.
   DILUTION FACTOR                                     22.40                 37.89                 25.24
   HC  CONCENTRATION PPM                                20.                   12.                   19.
   CO  CONCENTRATION PPM                                29.                   15.                   27.
   CO2 CONCENTRATION PCT                                .56                   .31                   .48
   NOX CONCENTRATION PPM                               21.2                  14.4                  20.9
   HC  MASS GRAMS                                      1.18                  1.28                  1.18
   CO  MASS GRAMS                                      3.53                  3.22                  3.27
   CO2 MASS GRAMS                                    1067.4                1039.6                 930.0
   NOX MASS GRAMS                                      4.53                  5.28                  4.46
   PARTICULATE MASS GRAMS                              1.82                  1.18                  1.61

   HC  GRAMS/KM                                         .20                   .20                   .20
   CO  GRAMS/KM                                         .61                   .51                   .56
   CO2 GRAMS/KM                                       183.6                 165.2                 159.5
   NOX GRAMS/KM                                         .78                   .84                   .77
   FUEL CONSUMPTION BY CB L/100KM                      6.89                  6.20                  5.99
   RUN TIME           SECONDS                          505.                  868.                  505.
   MEASURED DISTANCE  KM                               5.81                  6.29                  5.83

COMPOSITE RESULTS
   TEST NUMBER          63TU-4                                                                        3-BAG       (4-BAG)
   BAROMETER    MM HG   733.3                               CARBON DIOXIDE         G/KM              167.4      (   0.0)
   HUMIDITY     G/KG     12.5                               FUEL CONSUMPTION       L/100KM             6.28     (  0.00)
   TEMPERATURE  DEG C    24.4                               HYDROCARBONS (THC)     G/KM                 .20     (  0.00)
                                                            CARBON MONOXIDE        G/KM                 .55     (  0.00)
                                                            OXIDES OF NITROGEN     G/KM                 .81     (  0.00)
                                                            PARTICULATES           G/KM                .238     ( 0.000)
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APPENDIX C

PARTICULATE CONTROL SCREENING EVALUATION WITH THE MERCEDES

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                                   FTP    VEHICLE EMISSIONS RESULTS 6131-1 - EX-47 TRAP PRE-CHECK B.L.
                                            PROJECT 11-5810-001

TEST NO.   6131-1   RUN   1                VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES  BENZ          DATE     7/18/80                     ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                 BAG CART NO.  1                      DIESEL    EM-408-F
TRANSMISSION A3                            DYNO NO.      2                      ODOMETER  7057. KM( 4385. MILES)
                                           CVS NO.   3

BAROMETER 739.90 MM HG(29.13 IN HG)        DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
RELATIVE HUMIDITY  61. PCT                 ABS. HUMIDITY 10.9 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.01
BAG RESULTS
   BAG NUMBER                                   1                    2                    3
   DESCRIPTION                            COLD TRANSIENT         STABILIZED         HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           711.2 (28.0)        711.2 (28.0)         713.7 (28.1)
   BLOWER INLET P MM. H2O(IN. H2O)         569.0 (22.4)        571.5 (22.5)         571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)        36.7 ( 98.0)        35.0 ( 95.0)         36.7 ( 98.0)
   BLOWER REVOLUTIONS                         13904.              23567.               13816.
   TOT FLOW STD. CU. METRES(SCF)           134.9 ( 4760.)      229.7 ( 8111.)       134.0 ( 4732.)
   HC  SAMPLE METER/RANGE/PPM              11.5/11/  12.         9.2/11/   9.        9.1/11/   9.
   HC  BCKGRD METER/RANGE/PPM               3.4/ 1/   3.         3.4/ 1/   3.        3.4/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM              25.4/13/  23.        16.0/13/  14.       18.9/13/  17.
   CO  BCKGRD METER/RANGE/PPM               2.2/13/   2.         1.9/13/   2.         .9/13/   1.
   CO2 SAMPLE METER/RANGE/PCT              45.3/ 3/  .78        26.5/ 3/  .43       38.6/ 3/  .65
   CO2 BCKGRD METER/RANGE/PCT               2.8/ 3/  .04         3.4/ 3/  .05        3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM              24.3/ 2/  24.        15.5/ 2/  16.       25.2/ 2/  25.
   NOX BCKGRD METER/RANGE/PPM                .6/ 2/   1.          .6/ 2/   1.         .5/ 2/   1.
   DILUTION FACTOR                            17.17               30.74                20.48
   HC  CONCENTRATION PPM                       8.                  5.                   6.
   CO  CONCENTRATION PPM                      20.                 12.                  15.
   CO2 CONCENTRATION PCT                        .74                 .38                  .61
   NOX CONCENTRATION PPM                     23.7                14.9                 24.7
   HC  MASS GRAMS                               .65                 .65                  .45
   CO  MASS GRAMS                              3.17                3.25                 2.42
   CO2 MASS GRAMS                           1818.7              1612.3               1488.5
   NOX MASS GRAMS                              6.16                6.60                 6.38
   PARTICULATE MASS GRAMS                      1.47                1.36                 1.36

   HC  GRAMS/KM                                 .11                 .11                  .08
   CO  GRAMS/KM                                 .56                 .53                  .42
   CO2 GRAMS/KM                              318.2               262.1                259.6
   NOX GRAMS/KM                                1.08                1.07                 1.11
   FUEL CONSUMPTION BY CB L/100KM             11.88                9.79                 9.65
   RUN TIME              SECONDS              505.                869.                 504.
   MEASURED DISTANCE     KM                    5.72                6.15                 5.76

COMPOSITE RESULTS
   TEST NUMBER              6131-1
   BAROMETER     MM HG       739.9                       CARBON DIOXIDE        G/KM         3-BAG       (4-BAG)
   HUMIDITY      G/KG         10.9                       FUEL CONSUMPTION      L/100KM      272.8      (    0.0)
   TEMPERATURE   DEG C        22.8                       HYDROCARBONS (THC)    G/KM         10.19      (   0.00)
                                                         CARBON MONOXIDE       G/KM           .10      (   0.00)
                                                         OXIDES OF NITROGEN    G/KM           .50      (   0.00)
                                                         PARTICULATES          G/KM          1.08      (   0.00)
                                                                                              .233      ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS-6131C1 - EX-47 TRAP-10km
                                                 PROJECT 11-5810-001
TEST NO.   6131C1   RUN   1
VEHICLE MODEL   80 MERCEDES  BENZ              VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) I-5                     DATE    7/28/80                        ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
TRANSMISSION A3                                BAG CART NO.  1                        DIESEL     EM-408-F
                                               DYNO NO.      2                        ODOMETER  7128. KM( 4429. MILES)
                                               CVS NO.   3
BAROMETER 738.89 MM HG(29.09 IN HG)
RELATIVE HUMIDITY  73. PCT                     DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
BAG RESULTS                                    ABS. HUMIDITY 13.1 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.09
  BAG NUMBER                                       1                  2                  3
  DESCRIPTION                                COLD TRANSIENT       STABILIZED         HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              706.1 (27.8)       711.2 (28.0)       711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)            569.0 (22.4)       569.0 (22.4)       569.0 (22.4)
  BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)       34.4 ( 94.0)       35.6 ( 96.0)
  BLOWER REVOLUTIONS                            13830.             23830.             13853.
  TOT FLOW STD. CU. METRES(SCF)              134.0 ( 4731.)     231.5 ( 8174.)     134.3 ( 4741.)
  HC  SAMPLE METER/RANGE/PPM                 11.6/11/  12.        7.7/11/   8.        8.1/11/   8.
  HC  BCKGRD METER/RANGE/PPM                  3.7/ 1/   4.        2.9/ 1/   3.        2.9/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                 26.0/13/  23.       16.1/13/  14.       20.3/13/  18.
  CO  BCKGRD METER/RANGE/PPM                   .5/13/   0.         .4/13/   0.         .3/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                 46.5/ 3/  .80       26.9/ 3/  .44       39.2/ 3/  .66
  CO2 BCKGRD METER/RANGE/PCT                  2.8/ 3/  .04        2.8/ 3/  .04        3.0/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                 24.8/ 2/  25.       16.4/ 2/  16.       25.6/ 2/  26.
  NOX BCKGRD METER/RANGE/PPM                  1.3/ 2/   1.        1.5/ 2/   2.        1.8/ 2/   2.
  DILUTION FACTOR                               16.68              30.25              20.14
  HC  CONCENTRATION PPM                          8.                 5.                 5.
  CO  CONCENTRATION PPM                         22.                13.                17.
  CO2 CONCENTRATION PCT                          .76                .40                .62
  NOX CONCENTRATION PPM                         23.6               14.9               23.9
  HC  MASS GRAMS                                 .63                .66                .41
  CO  MASS GRAMS                                3.44               3.62               2.68
  CO2 MASS GRAMS                              1863.7             1492.9             1522.3
  NOX MASS GRAMS                                6.56               7.10               6.66
  PARTICULATE MASS GRAMS                         .36                .36                .30

  HC  GRAMS/KM                                   .11                .11                .07
  CO  GRAMS/KM                                   .60                .59                .47
  CO2 GRAMS/KM                                 325.9              275.0              268.4
  NOX GRAMS/KM                                  1.15               1.17               1.17
  FUEL CONSUMPTION BY CB L/100KM               12.17              10.28              10.02
  RUN TIME                   SECONDS            504.               869.               505.
  MEASURED DISTANCE          KM                 5.72               6.16               5.67
COMPOSITE RESULTS
  TEST NUMBER             6131C1
  BAROMETER     MM HG     738.9                         CARBON DIOXIDE         G/KM        3-BAG       (4-BAG)
  HUMIDITY      G/KG       13.1                         FUEL CONSUMPTION       L/100KM     283.9       (   0.0)
  TEMPERATURE   DEG C      22.8                         HYDROCARBONS (THC)     G/KM        10.60       (  0.00)
                                                        CARBON MONOXIDE        G/KM          .10       (  0.00)
                                                        OXIDES OF NITROGEN     G/KM          .56       (  0.00)
                                                        PARTICULATES           G/KM         1.17       (  0.00)
                                                                                             .058       ( 0.000)
                                        FTP    VEHICLE EMISSIONS RESULTS-6131C2 - EX-47 TRAP-130 km
                                                PROJECT 11-5810-001

TEST NO.   6131C2   RUN   2                     VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES  BENZ               DATE     8/ 5/80                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 1.5 L( 90. CID) L-5                      BAG CART NO.  1                        DIESEL    EM-408-F
TRANSMISSION A3                                 DYNO NO.      2                        ODOMETER  7279. KM( 4523. MILES)
                                                CVS NO.   3

BAROMETER 739.14 MM HG(29.10 IN HG)             DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  59. PCT                      ABS. HUMIDITY 11.7 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
  BAG NUMBER                                          1                   2                   3
  DESCRIPTION                                   COLD TRANSIENT       STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                  711.2 (28.0)        716.3 (28.2)        716.3 (28.2)
  BLOWER INLET P MM. H2O(IN. H2O)                558.8 (22.0)        569.0 (22.4)        563.9 (22.2)
  BLOWER INLET TEMP. DEG. C(DEG. F)               35.6 ( 96.0)        33.9 ( 93.0)        36.1 ( 97.0)
  BLOWER REVOLUTIONS                                13866.              23749.              13814.
  TOT FLOW STD. CU. METRES(SCF)                  134.6 ( 4752.)      231.1 ( 8161.)      134.0 ( 4730.)
  HC   SAMPLE METER/RANGE/PPM                    12.4/11/  12.        8.9/11/   9.        9.9/11/  10.
  HC   BCKGRD METER/RANGE/PPM                     4.4/ 1/   4.        4.5/ 1/   5.        4.5/ 1/   5.
  CO   SAMPLE METER/RANGE/PPM                    27.0/13/  24.       17.1/13/  15.       20.9/13/  19.
  CO   BCKGRD METER/RANGE/PPM                      .9/13/   1.         .9/13/   1.         .8/13/   1.
  CO2  SAMPLE METER/RANGE/PCT                    44.2/ 3/  .76       25.4/ 3/  .41       37.2/ 3/  .63
  CO2  BCKGRD METER/RANGE/PCT                     2.7/ 3/  .04        2.4/ 3/  .04        2.5/ 3/  .04
  NOX  SAMPLE METER/RANGE/PPM                    23.6/ 2/  24.       14.9/ 2/  15.       23.6/ 2/  24.
  NOX  BCKGRD METER/RANGE/PPM                      .8/ 2/   1.         .9/ 2/   1.         .8/ 2/   1.
  DILUTION FACTOR                                   17.63               32.14               21.31
  HC   CONCENTRATION PPM                             8.                  4.                  6.
  CO   CONCENTRATION PPM                            23.                 14.                 17.
  CO2  CONCENTRATION PCT                             .72                 .39                 .59
  NOX  CONCENTRATION PPM                            22.8                14.0                22.8
  HC   MASS GRAMS                                    .64                 .60                 .43
  CO   MASS GRAMS                                   3.56                3.76                2.71
  CO2  MASS GRAMS                                 1767.9              1604.0              1446.0
  NOX  MASS GRAMS                                   6.07                6.40                6.04
  PARTICULATE MASS GRAMS                             .38                 .27                 .24

  HC   GRAMS/KM                                      .11                 .10                 .08
  CO   GRAMS/KM                                      .62                 .61                 .47
  CO2  GRAMS/KM                                    309.5               261.6               252.2
  NOX  GRAMS/KM                                     1.06                1.04                1.05
  FUEL CONSUMPTION BY CB L/100KM                   11.56                9.78                9.42
  RUN TIME              SECONDS                    505.                849.                505.
  MEASURED DISTANCE     KM                          5.71                6.13                5.73

COMPOSITE RESULTS
  TEST NUMBER              6131C2
  BAROMETER     MM HG       739.1                                                    3-BAG        (4-BAG)
  HUMIDITY      G/KG         11.7          CARBON DIOXIDE          G/KM              248.9       (    0.0)
  TEMPERATURE   DEG C        24.4          FUEL CONSUMPTION        L/100KM           10.05       (   0.00)
                                           HYDROCARBONS (THC)      G/KM                .09       (   0.00)
                                           CARBON MONOXIDE         G/KM                .58       (   0.00)
                                           OXIDES OF NITROGEN      G/KM               1.05       (   0.00)
                                           PARTICULATES            G/KM               .049       (  0.000)
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                                    FTP    VEHICLE EMISSIONS RESULTS-6131C3 - EX-47 TRAP - 230 km
                                             PROJECT 11-5810-001

TEST NO.   6131C3   RUN   2                  VEHICLE NO.61                               TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES                  DATE    8/13/80                             ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
ENGINE 1.5 L( 90. CID) L-5                   BAG CART NO.  1                             DIESEL     EM-408-F
TRANSMISSION A3                              DYNO NO.      2                             ODOMETER  7403. KM( 4600. MILES)
                                             CVS NO.   3

BAROMETER 740.41 MM HG(29.15 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  43. PCT                   ABS. HUMIDITY 12.9 GM/KG                    NOX HUMIDITY CORRECTION FACTOR  1.08
BAG RESULTS
   BAG NUMBER                                        1                    2                     3
   DESCRIPTION                               COLD TRANSIENT          STABILIZED          HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              723.9 (28.5)         723.9 (28.5)         723.9 (28.5)
   BLOWER INLET P MM. H2O(IN. H2O)            569.0 (22.4)         569.0 (22.4)         622.3 (24.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)         34.4 ( 94.0)         36.7 ( 98.0)
   BLOWER REVOLUTIONS                            13850.               23792.               13841.
   TOT FLOW STD. CU. METRES(SCF)              134.4 ( 4747.)       231.6 ( 8178.)       133.8 ( 4725.)
   HC  SAMPLE METER/RANGE/PPM                  10.4/11/  10.         7.8/11/   8.        8.4/11/   8.
   HC  BCKGRD METER/RANGE/PPM                   4.3/ 1/   4.         3.5/ 1/   4.        3.5/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                  23.2/13/  21.        14.1/13/  12.       18.0/13/  16.
   CO  BCKGRD METER/RANGE/PPM                    .1/13/   0.          .2/13/   0.         .3/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                  43.9/ 3/  .75        25.2/ 3/  .41       37.6/ 3/  .63
   CO2 BCKGRD METER/RANGE/PCT                   2.7/ 3/  .04         2.7/ 3/  .04        3.0/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                  25.2/ 2/  25.        15.4/ 2/  15.       23.8/ 2/  24.
   NOX BCKGRD METER/RANGE/PPM                   2.5/ 2/   3.         1.9/ 2/   2.        1.5/ 2/   2.
   DILUTION FACTOR                                 17.78                32.44                21.09
   HC  CONCENTRATION PPM                             6.                   4.                   5.
   CO  CONCENTRATION PPM                            20.                  12.                  15.
   CO2 CONCENTRATION PCT                            .71                  .37                  .59
   NOX CONCENTRATION PPM                           22.8                 13.6                 22.4
   HC  MASS GRAMS                                   .48                  .59                  .39
   CO  MASS GRAMS                                  3.12                 3.21                 2.37
   CO2 MASS GRAMS                                1751.9               1573.4               1444.5
   NOX MASS GRAMS                                  6.32                 6.47                 6.17
   PARTICULATE MASS GRAMS                           .34                  .30                  .32

   HC  GRAMS/KM                                     .08                  .08                  .07
   CO  GRAMS/KM                                     .54                  .52                  .42
   CO2 GRAMS/KM                                   304.2                252.5                254.4
   NOX GRAMS/KM                                    1.10                 1.04                 1.09
   FUEL CONSUMPTION BY CB L/100KM                 11.35                 9.43                 9.49
   RUN TIME                  SECONDS               505.                 867.                 505.
   MEASURED DISTANCE         KM                    5.76                 6.23                 5.68

COMPOSITE RESULTS
   TEST NUMBER            6131C3                                                                   3-BAG       (4-BAG)
   BAROMETER      MM HG   740.4                          CARBON DIOXIDE          G/KM              263.7      (   0.0)
   HUMIDITY       G/KG     12.9                          FUEL CONSUMPTION        L/100KM            9.85      (  0.00)
   TEMPERATURE    DEG C    25.0                          HYDROCARBONS (THC)      G/KM                .08      (  0.00)
                                                         CARBON MONOXIDE         G/KM                .49      (  0.00)
                                                         OXIDES OF NITROGEN      G/KM               1.06      (  0.00)
                                                         PARTICULATES            G/KM               .052      ( 0.000)
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                                         FTP    VEHICLE EMISSIONS RESULTS-6131C4 - EX-47 TRAP-POST GEN.
                                                 PROJECT 11-5810-001
TEST NO.   6131C4    RUN   1
VEHICLE MODEL    80 BED MERCEDES               VEHICLE NO.41                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                     DATE     9/29/80                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                                BAG CART NO.  1                        DIESEL    EM-408-F
                                               DYNO NO.      2                        ODOMETER  7556. KM( 4695. MILES)
                                               CVS NO.   3

BAROMETER 743.97 MM HG(29.29 IN HG)            DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
RELATIVE HUMIDITY  57. PCT                     ABS. HUMIDITY 12.9 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.09
BAG RESULTS
  BAG NUMBER                                        1                2                   3
  DESCRIPTION                                 COLD TRANSIENT     STABILIZED        HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               704.1 (27.8)      711.2 (28.0)      704.1 (27.8)
  BLOWER INLET P MM. H2O(IN. H2O)             558.8 (22.0)      569.0 (22.4)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            36.4 ( 97.5)      35.8 ( 96.5)      38.1 (100.5)
  BLOWER REVOLUTIONS                             13844.            23817.            13858.
  TOT FLOW STD. CU. METRES(SCF)               135.6 ( 4788.)    233.0 ( 8226.)    135.2 ( 4774.)
  HC  SAMPLE METER/RANGE/PPM                   7.0/11/   7.      4.8/11/   5.      4.0/11/   4.
  HC  BCKGRD METER/RANGE/PPM                   3.0/ 1/   3.      2.5/ 1/   3.      2.5/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                  24.3/13/  24.     14.7/13/  15.     18.8/13/  18.
  CO  BCKGRD METER/RANGE/PPM                   1.7/13/   1.       .8/13/   1.       .1/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                  45.7/ 3/  .78     27.4/ 3/  .45     38.5/ 3/  .67
  CO2 BCKGRD METER/RANGE/PCT                   3.0/ 3/  .05      2.8/ 3/  .04      2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                  23.8/ 2/  24.     15.8/ 2/  16.     24.0/ 2/  24.
  NOX BCKGRD METER/RANGE/PPM                    .8/ 2/   1.      1.0/ 2/   1.      1.1/ 2/   1.
  DILUTION FACTOR                                 17.01             29.68             19.88
  HC  CONCENTRATION PPM                             4.                2.                4.
  CO  CONCENTRATION PPM                            21.               14.               17.
  CO2 CONCENTRATION PCT                             .74               .41               .63
  NOX CONCENTRATION PPM                            23.0              14.8              23.0
  HC  MASS GRAMS                                    .33               .33               .28
  CO  MASS GRAMS                                   3.38              3.72              2.67
  CO2 MASS GRAMS                                 1838.0            1734.8            1550.8
  NOX MASS GRAMS                                   6.40              7.11              6.38
  PARTICULATE MASS GRAMS                            .22               .18               .18

  HC  GRAMS/KM                                      .06               .05               .05
  CO  GRAMS/KM                                      .58               .60               .47
  CO2 GRAMS/KM                                    320.8             280.7             271.1
  NOX GRAMS/KM                                     1.12              1.15              1.12
  FUEL CONSUMPTION BY CB L/100KM                  11.88             10.48             10.12
  RUN TIME           SECONDS                      504.              869.              505.
  MEASURED DISTANCE     KM                        5.73              6.18              5.72

COMPOSITE RESULTS
  TEST NUMBER            6131C4
  BAROMETER     MM HG   744.0                              3-BAG      (4-BAG)
  HUMIDITY      G/KG     12.9   CARBON DIOXIDE      G/KM    286.4    (   0.0)
  TEMPERATURE   DEG C    26.7   FUEL CONSUMPTION    L/100KM  10.49   (  0.00)
                                HYDROCARBONS (THC)  G/KM       .05   (  0.00)
                                CARBON MONOXIDE     G/KM       .54   (  0.00)
                                OXIDES OF NITROGEN  G/KM      1.13   (  0.00)
                                PARTICULATES        G/KM      .032   ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS  - TEXACO PARTICULATE TRAP
                                           PROJECT 11-5810-001
TEST NO.   6161C1   RUN   1
VEHICLE MODEL   80 MERCEDES BENZ           VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) I-5                 DATE     4/ 2/81                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                            BAG CART NO.  1                        DIESEL     EM-408-F
                                           DYNO NO.      2                        ODOMETER  7612. KM( 4730. MILES)
                                           CVS NO.   3
BAROMETER 742.19 MM HG(29.22 IN HG)
RELATIVE HUMIDITY  51. PCT                 DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
BAG RESULTS                                ABS. HUMIDITY  9.8 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .97
  BAG NUMBER                                    1                  2                   3
  DESCRIPTION                             COLD TRANSIENT      STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)           711.2 (28.0)      716.3 (28.2)      716.3 (28.2)
  BLOWER INLET P MM. H2O(IN. H2O)         571.5 (22.5)      584.2 (23.0)      584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)        36.1 ( 97.0)      35.6 ( 96.0)      36.7 ( 98.0)
  BLOWER REVOLUTIONS                         13854.            23784.            13857.
  TOT FLOW STD. CU. METRES(SCF)           135.0 ( 4767.)    231.7 ( 8182.)    134.7 ( 4758.)
  HC   SAMPLE METER/RANGE/PPM             10.0/11/  10.      8.1/11/   8.      8.8/11/   9.
  HC   BCKGRD METER/RANGE/PPM              7.0/ 1/   7.      6.8/ 1/   7.      6.8/ 1/   7.
  CO   SAMPLE METER/RANGE/PPM             27.8/13/  25.     17.2/13/  16.     23.1/13/  21.
  CO   BCKGRD METER/RANGE/PPM              1.9/13/   2.      1.6/13/   1.      2.1/13/   2.
  CO2  SAMPLE METER/RANGE/PCT             46.7/ 3/  .80     27.6/ 3/  .45     40.4/ 3/  .69
  CO2  BCKGRD METER/RANGE/PCT              3.3/ 3/  .05      2.7/ 3/  .04      3.0/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM             27.9/ 2/  28.     17.2/ 2/  17.     27.3/ 2/  27.
  NOX  BCKGRD METER/RANGE/PPM               .9/ 2/   1.      1.0/ 2/   1.       .9/ 2/   1.
  DILUTION FACTOR                           16.60             29.42             19.47
  HC   CONCENTRATION PPM                     3.                2.                2.
  CO   CONCENTRATION PPM                    23.               14.               19.
  CO2  CONCENTRATION PCT                     .76               .41               .64
  NOX  CONCENTRATION PPM                    27.1              16.2              26.4
  HC   MASS GRAMS                             .27               .21               .18
  CO   MASS GRAMS                            3.63              3.74              2.93
  CO2  MASS GRAMS                         1869.6            1753.2            1582.8
  NOX  MASS GRAMS                            6.77              6.97              6.61
  PARTICULATE MASS GRAMS                      .57               .36               .46

  HC   GRAMS/KM                               .05               .03               .03
  CO   GRAMS/KM                               .62               .59               .50
  CO2  GRAMS/KM                            320.4             278.6             271.7
  NOX  GRAMS/KM                              1.16              1.11              1.13
  FUEL CONSUMPTION BY CB L/100KM            11.96             10.40             10.14
  RUN TIME                 SECONDS         505.              866.              505.
  MEASURED DISTANCE        KM                5.83              6.29              5.83
  SCF, DRY                                   .976              .979              .977
COMPOSITE RESULTS
  TEST NUMBER            6161C1                                                        3-BAG       (4-BAG)
  BAROMETER     MM HG   742.2              CARBON DIOXIDE          G/KM               285.4      (   0.0)
  HUMIDITY      G/KG      9.8              FUEL CONSUMPTION        L/100KM             10.65     (   0.00)
  TEMPERATURE   DEG C    23.9              HYDROCARBONS (THC)      G/KM                  .04     (   0.00)
                                           CARBON MONOXIDE         G/KM                  .57     (   0.00)
                                           OXIDES OF NITROGEN      G/KM                 1.13     (   0.00)
                                           PARTICULATES            G/KM                  .072    ( 0.000)
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                       FTP    VEHICLE EMISSIONS RESULTS - TEXACO PARTICULATE TRAP
                                PROJECT 11-5810-001

TEST NO.   6161C2   RUN  1                VEHICLE NO.61                TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES BENZ          DATE     4/ 3/81             ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) I-5                BAG CART NO.  1              DIESEL     EM-465-F
TRANSMISSION A3                           DYNO NO.      2              ODOMETER  7643. KM( 4749. MILES)
                                          CVS NO.   3

BAROMETER 729.74 MM HG(28.73 IN HG)       DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  51. PCT                ABS. HUMIDITY 11.2 GM/KG      NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
   BAG NUMBER                                   1                2                3
   DESCRIPTION                            COLD TRANSIENT     STABILIZED      HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           698.5 (27.5)     711.2 (28.0)     701.0 (27.6)
   BLOWER INLET P MM. H2O(IN. H2O)         563.9 (22.2)     571.5 (22.5)     569.0 (22.4)
   BLOWER INLET TEMP. DEG. C(DEG. F)        37.2 ( 99.0)     36.1 ( 97.0)     37.8 (100.0)
   BLOWER REVOLUTIONS                         13796.           23863.           13863.
   TOT FLOW STD. CU. METRES(SCF)           132.0 ( 4660.)   228.2 ( 8058.)   132.3 ( 4673.)
   HC  SAMPLE METER/RANGE/PPM               9.6/11/  10.     7.6/11/   8.     8.6/11/   9.
   HC  BCKGRD METER/RANGE/PPM               5.9/ 1/   6.     6.0/ 1/   6.     6.4/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM              26.5/13/  24.    15.6/13/  14.    20.9/13/  19.
   CO  BCKGRD METER/RANGE/PPM                .1/13/   0.      .2/13/   0.      .3/13/   0.
   CO2 SAMPLE METER/RANGE/PCT              47.6/ 3/  .82    27.4/ 3/  .45    40.0/ 3/  .68
   CO2 BCKGRD METER/RANGE/PCT               3.8/ 3/  .06     3.1/ 3/  .05     3.3/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM              27.6/ 2/  28.    17.5/ 2/  18.    26.2/ 2/  26.
   NOX BCKGRD METER/RANGE/PPM               1.1/ 2/   1.     1.1/ 2/   1.     1.0/ 2/   1.
   DILUTION FACTOR                              16.26            29.66            19.69
   HC  CONCENTRATION PPM                         4.               2.               3.
   CO  CONCENTRATION PPM                        23.              14.              18.
   CO2 CONCENTRATION PCT                         .77              .40              .63
   NOX CONCENTRATION PPM                        26.6             16.4             25.3
   HC  MASS GRAMS                                 .31              .24              .19
   CO  MASS GRAMS                                3.60             3.62             2.81
   CO2 MASS GRAMS                             1851.8           1686.8           1525.9
   NOX MASS GRAMS                                6.81             7.28             6.49
   PARTICULATE MASS GRAMS                         .37              .35              .23

   HC  GRAMS/KM                                   .05              .04              .03
   CO  GRAMS/KM                                   .63              .58              .49
   CO2 GRAMS/KM                                322.3            272.1            266.2
   NOX GRAMS/KM                                  1.18             1.17             1.13
   FUEL CONSUMPTION BY CB L/100KM               12.03            10.16             9.93
   RUN TIME            SECONDS                 505.             869.             505.
   MEASURED DISTANCE    KM                       5.75             6.20             5.73
   SCF, DRY                                      .976             .980             .977

COMPOSITE RESULTS                                                                 3-BAG      (4-BAG)
   TEST NUMBER        6161C2                 CARBON DIOXIDE      G/KM             280.9     (   0.0)
   BAROMETER    MM HG  729.7                 FUEL CONSUMPTION    L/100KM          10.48     (  0.00)
   HUMIDITY     G/KG    11.2                 HYDROCARBONS (THC)  G/KM               .04     (  0.00)
   TEMPERATURE  DEG C   26.1                 CARBON MONOXIDE     G/KM               .57     (  0.00)
                                             OXIDES OF NITROGEN  G/KM              1.16     (  0.00)
                                             PARTICULATES        G/KM              .053     ( 0.000)
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                               FTP   VEHICLE EMISSIONS RESULTS  - TEXACO PARTICULATE TRAP
                                      PROJECT 11-5810-001

 TEST NO.   6162C1   RUN   1          VEHICLE NO.61                    TEST WEIGHT  1814. KG( 4000. LBS)
 VEHICLE MODEL   80 MERCEDES  300SD   DATE    4/ 9/81                  ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
 ENGINE 3.0 L(183. CID) L-5           BAG CART NO.  1                  DIESEL     EM-465-F
 TRANSMISSION A3                      DYNO NO.      2                  ODOMETER  7755. KM( 4819. MILES)
                                      CVS NO.   3

 BAROMETER 741.17 MM HG(29.18 IN HG)  DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
 RELATIVE HUMIDITY  46. PCT           ABS. HUMIDITY  9.7 GM/KG         NOX HUMIDITY CORRECTION FACTOR   .97
 BAG RESULTS
   BAG NUMBER                              1              2              3
   DESCRIPTION                       COLD TRANSIENT    STABILIZED    HOT TRANSIENT      STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)      711.2 (28.0)    711.2 (28.0)    711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)    563.9 (22.2)    571.5 (22.5)    571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)   36.7 ( 98.0)    33.9 ( 93.0)    37.2 ( 99.0)
   BLOWER REVOLUTIONS                   13874.          23823.          13873.
   TOT FLOW STD. CU. METRES(SCF)      135.1 ( 4770.)  232.9 ( 8224.)  134.9 ( 4762.)
   HC  SAMPLE METER/RANGE/PPM          7.6/11/   8.    6.4/11/   6.    6.9/11/   7.
   HC  BCKGRD METER/RANGE/PPM          5.0/ 1/   5.    4.5/ 1/   5.    4.5/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM         26.7/13/  24.   17.9/13/  16.   25.2/13/  23.
   CO  BCKGRD METER/RANGE/PPM          1.1/13/   1.    2.0/13/   2.    4.7/13/   4.
   CO2 SAMPLE METER/RANGE/PCT         45.5/ 3/  .78   26.1/ 3/  .43   39.1/ 3/  .66
   CO2 BCKGRD METER/RANGE/PCT          2.9/ 3/  .04    2.8/ 3/  .04    2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM         26.4/ 2/  26.   17.3/ 2/  17.   26.9/ 2/  27.
   NOX BCKGRD METER/RANGE/PPM           .7/ 2/   1.    1.2/ 2/   1.    1.3/ 2/   1.
   DILUTION FACTOR                       17.09           31.23           20.18
   HC  CONCENTRATION PPM                  3.              2.              3.
   CO  CONCENTRATION PPM                 23.             14.             18.
   CO2 CONCENTRATION PCT                  .74             .39             .62
   NOX CONCENTRATION PPM                 25.7            16.1            25.7
   HC  MASS GRAMS                          .23             .27             .20
   CO  MASS GRAMS                         3.59            3.84            2.90
   CO2 MASS GRAMS                       1828.4          1643.1          1535.3
   NOX MASS GRAMS                         6.44            6.97            6.41
   PARTICULATE MASS GRAMS                  .36             .31             .25

   HC  GRAMS/KM                            .04             .04             .04
   CO  GRAMS/KM                            .63             .63             .50
   CO2 GRAMS/KM                          320.6           267.5           267.3
   NOX GRAMS/KM                           1.13            1.13            1.12
   FUEL CONSUMPTION BY CB L/100KM        11.97            9.99            9.98
   RUN TIME           SECONDS            505.            868.            505.
   MEASURED DISTANCE    KM               5.70            6.14            5.74
   SCF, DRY                              .978            .981            .979

COMPOSITE RESULTS                                                            3-BAG     (4-BAG)
   TEST NUMBER         6162C1                         CARBON DIOXIDE     G/KM      278.4    (   0.0)
   BAROMETER    MM HG  741.2                          FUEL CONSUMPTION   L/100KM   10.40    (  0.00)
   HUMIDITY     G/KG     9.7                          HYDROCARBONS (THC) G/KM        .04    (  0.00)
   TEMPERATURE  DEG C   25.6                          CARBON MONOXIDE    G/KM        .59    (  0.00)
                                                      OXIDES OF NITROGEN G/KM       1.13    (  0.00)
                                                      PARTICULATES       G/KM       .051    ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS - W. R. GRACE PARTICULATE TRAP
                                                PROJECT 11-5810-001
TEST NO.   6171C1   RUN   1
VEHICLE MODEL   80 MERCEDES  300SD          VEHICLE NO.61                                TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                  DATE    4/17/81                              ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
TRANSMISSION A3                             BAG CART NO.  1                              DIESEL    EM-465-F
                                            DYNO NO.      2                              ODOMETER  7913. KM( 4917. MILES)
                                            CVS NO.   3

BAROMETER 744.73 MM HG(29.32 IN HG)         DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  60. PCT                  ABS. HUMIDITY 12.6 GM/KG
BAG RESULTS                                                                              NOX HUMIDITY CORRECTION FACTOR  1.07
   BAG NUMBER                                     1                    2                    3
   DESCRIPTION                              COLD TRANSIENT         STABILIZED          HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)         711.2 (28.0)         711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)           576.6 (22.7)         576.6 (22.7)         576.6 (22.7)
   BLOWER INLET TEMP. DEG. C(DEG. F)          37.2 ( 99.0)         35.0 ( 95.0)         38.3 (101.0)
   BLOWER REVOLUTIONS                          13873.               23805.               13862.
   TOT FLOW STD. CU. METRES(SCF)             135.7 ( 4790.)       233.6 ( 8248.)       135.3 ( 4777.)
   HC  SAMPLE METER/RANGE/PPM                12.8/11/  13.        10.5/11/  10.         9.4/11/   9.
   HC  BCKGRD METER/RANGE/PPM                 6.2/ 1/   6.         5.0/ 1/   5.         5.0/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM                29.2/13/  27.        17.7/13/  16.        22.7/13/  21.
   CO  BCKGRD METER/RANGE/PPM                 4.0/13/   4.         3.0/13/   3.         3.3/13/   3.
   CO2 SAMPLE METER/RANGE/PCT                45.8/ 3/  .79        25.7/ 3/  .42        39.3/ 3/  .66
   CO2 BCKGRD METER/RANGE/PCT                 2.6/ 3/  .04         2.7/ 3/  .04         2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                25.7/ 2/  26.        16.1/ 2/  16.        25.6/ 2/  26.
   NOX BCKGRD METER/RANGE/PPM                  .9/ 2/   1.          .7/ 2/   1.          .7/ 2/   1.
   DILUTION FACTOR                              16.75                31.72                20.07
   HC  CONCENTRATION PPM                          7.                   6.                   5.
   CO  CONCENTRATION PPM                         23.                  13.                  17.
   CO2 CONCENTRATION PCT                         .75                  .38                  .63
   NOX CONCENTRATION PPM                        24.9                 15.4                 24.9
   HC  MASS GRAMS                                .54                  .76                  .36
   CO  MASS GRAMS                               3.56                 3.55                 2.72
   CO2 MASS GRAMS                             1861.3               1624.4               1549.2
   NOX MASS GRAMS                               6.88                 7.35                 6.88
   PARTICULATE MASS GRAMS                        .38                  .37                  .29

   HC  GRAMS/KM                                  .09                  .12                  .06
   CO  GRAMS/KM                                  .62                  .50                  .48
   CO2 GRAMS/KM                                324.2                263.1                272.2
   NOX GRAMS/KM                                 1.20                 1.19                 1.21
   FUEL CONSUMPTION BY CB L/100KM              12.11                 9.83                10.16
   RUN TIME            SECONDS                 505.                 867.                 505.
   MEASURED DISTANCE    KM                     5.74                 6.17                 5.69
   SCF, DRY                                    .973                 .977                 .974

COMPOSITE RESULTS
   TEST NUMBER           6171C1                                                               3-BAG      (4-BAG)
   BARONETER     MM HG    744.7                            CARBON DIOXIDE         G/KM         278.2     (   0.0)
   HUMIDITY      G/KG      12.6                            FUEL CONSUMPTION       L/100KM      10.39     (  0.00)
   TEMPERATURE   DEG C     25.6                            HYDROCARBONS (THC)     G/KM           .10     (  0.00)
                                                           CARBON MONOXIDE        G/KM           .56     (  0.00)
                                                           OXIDES OF NITROGEN     G/KM          1.20     (  0.00)
                                                           PARTICULATES           G/KM          .059     ( 0.000)
                                        FTP    VEHICLE EMISSIONS RESULTS - W. R. GRACE PARTICULATE TRAP
                                                PROJECT 11-5810-001

TEST NO.   6171C2    RUN   1                  VEHICLE NO.61                                  TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES  300SD            DATE    4/20/81                                ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                    BAG CART NO.   1                               DIESEL     EM-465-F
TRANSMISSION A3                               DYNO NO.       2                               ODOMETER   7953. KM( 4942. MILES)
                                              CVS NO.    3

BAROMETER 740.16 MM HG(29.14 IN HG)           DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)
RELATIVE HUMIDITY  58. PCT                    ABS. HUMIDITY 13.6 GM/KG                       NOX HUMIDITY CORRECTION FACTOR  1.10
BAG RESULTS
  BAG NUMBER                                       1                      2                      3
  DESCRIPTION                                COLD TRANSIENT          STABILIZED           HOT TRANSIENT          STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)           711.2 (28.0)           711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)            571.5 (22.5)           571.5 (22.5)           571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)           37.8 (100.0)           35.0 ( 95.0)           35.6 ( 96.0)
  BLOWER REVOLUTIONS                            13878.                 23759.                 13859.
  TOT FLOW STD. CU. METRES(SCF)              134.2 ( 4738.)         230.8 ( 8149.)         134.4 ( 4746.)
  HC  SAMPLE METER/RANGE/PPM                 11.4/11/  11.           9.7/11/  10.          10.8/11/  11.
  HC  BCKGRD METER/RANGE/PPM                  6.1/ 1/   6.           6.4/ 1/   6.           6.9/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM                 29.5/13/  27.          20.6/13/  17.          24.6/13/  22.
  CO  BCKGRD METER/RANGE/PPM                  6.4/13/   6.           6.8/13/   6.           5.9/13/   5.
  CO2 SAMPLE METER/RANGE/PCT                 44.9/ 3/  .77          26.9/ 3/  .44          40.5/ 3/  .69
  CO2 BCKGRD METER/RANGE/PCT                  3.5/ 3/  .05           3.4/ 3/  .05           3.9/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM                 22.9/ 2/  23.          15.1/ 2/  15.          25.6/ 2/  26.
  NOX BCKGRD METER/RANGE/PPM                   .1/ 2/   0.            .1/ 2/   0.            .3/ 2/   0.
  DILUTION FACTOR                               17.33                  30.21                  19.41
  HC  CONCENTRATION PPM                           6.                     4.                     4.
  CO  CONCENTRATION PPM                          21.                    12.                    17.
  CO2 CONCENTRATION PCT                          .72                    .39                    .63
  NOX CONCENTRATION PPM                         22.8                   15.0                   25.3
  HC  MASS GRAMS                                 .44                    .47                    .33
  CO  MASS GRAMS                                3.26                   3.34                   2.63
  CO2 MASS GRAMS                              1766.8                 1649.7                 1551.0
  NOX MASS GRAMS                                6.46                   7.31                   7.18
  PARTICULATE MASS GRAMS                         .39                    .33                    .33

  HC  GRAMS/KM                                   .08                    .08                    .06
  CO  GRAMS/KM                                   .57                    .54                    .46
  CO2 GRAMS/KM                                 307.6                  267.0                  270.4
  NOX GRAMS/KM                                  1.12                   1.18                   1.25
  FUEL CONSUMPTION BY CB L/100KM               11.48                   9.97                  10.09
  RUN TIME              SECONDS                 505.                   868.                   505.
  MEASURED DISTANCE     KM                      5.74                   6.18                   5.74
  SCF, DRY                                      .974                   .977                   .975

COMPOSITE RESULTS
  TEST NUMBER            6171C2                                                                  3-BAG      (4-BAG)
  BAROMETER     MM HG    740.2                              CARBON DIOXIDE         G/KM          276.3      (   0.0)
  HUMIDITY      G/KG      13.6                              FUEL CONSUMPTION       L/100KM       10.32      (  0.00)
  TEMPERATURE   DEG C     27.2                              HYDROCARBONS (THC)     G/KM            .07      (  0.00)
                                                            CARBON MONOXIDE        G/KM            .52      (  0.00)
                                                            OXIDES OF NITROGEN     G/KM           1.19      (  0.00)
                                                            PARTICULATES           G/KM           .058      ( 0.000)
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                                     FTP    VEHICLE EMISSIONS RESULTS - W. R. GRACE PARTICULATE TRAP
                                              PROJECT 11-5810-001
TEST NO.   6172C1   RUN   1
VEHICLE MODEL   80 MERCEDES 300SD            VEHICLE NO.61                                TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                   DATE     4/23/81                             ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                              BAG CART NO.  1                              DIESEL    EM-465-F
                                             DYNO NO.      2                              ODOMETER  8237. KM( 5118. MILES)
                                             CVS NO.   3
BAROMETER 736.60 MM HG(29.00 IN HG)
RELATIVE HUMIDITY  66. PCT                   DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
BAG RESULTS                                  ABS. HUMIDITY 12.2 GM/KG                     NOX HUMIDITY CORRECTION FACTOR  1.05
   BAG NUMBER                                  1                    2                      3
   DESCRIPTION                           COLD TRANSIENT        STABILIZED            HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          706.1 (27.8)         706.1 (27.8)          706.1 (27.8)
   BLOWER INLET P MM. H2O(IN. H2O)        566.4 (22.3)         566.4 (22.3)          566.4 (22.3)
   BLOWER INLET TEMP. DEG. C(DEG. F)       36.7 ( 98.0)         35.0 ( 95.0)          37.8 (100.0)
   BLOWER REVOLUTIONS                        13878.               23817.                13875.
   TOT FLOW STD. CU. METRES(SCF)          134.2 ( 4737.)       230.9 ( 8152.)        133.9 ( 4729.)
   HC   SAMPLE METER/RANGE/PPM            12.6/11/  13.         8.1/11/   8.          9.9/11/  10.
   HC   BCKGRD METER/RANGE/PPM             4.7/ 1/   5.         4.5/ 1/   5.          5.7/ 1/   6.
   CO   SAMPLE METER/RANGE/PPM            30.0/13/  28.        18.1/13/  16.         23.8/13/  22.
   CO   BCKGRD METER/RANGE/PPM             1.6/13/   1.         1.7/13/   2.          1.5/13/   1.
   CO2  SAMPLE METER/RANGE/PCT            46.8/ 3/  .81        27.0/ 3/  .44         40.5/ 3/  .69
   CO2  BCKGRD METER/RANGE/PCT             3.1/ 3/  .05         3.4/ 3/  .05          3.3/ 3/  .05
   NOX  SAMPLE METER/RANGE/PPM            25.2/ 2/  25.        15.3/ 2/  15.         25.0/ 2/  25.
   NOX  BCKGRD METER/RANGE/PPM              .2/ 2/   0.          .1/ 2/   0.           .6/ 2/   1.
   DILUTION FACTOR                            16.55                30.11                 19.42
   HC   CONCENTRATION PPM                      8.                   4.                    4.
   CO   CONCENTRATION PPM                     25.                  15.                   20.
   CO2  CONCENTRATION PCT                      .76                  .39                   .64
   NOX  CONCENTRATION PPM                     25.0                 15.2                  24.4
   HC   MASS GRAMS                              .63                  .50                   .34
   CO   MASS GRAMS                             3.94                 3.70                  3.08
   CO2  MASS GRAMS                          1869.8               1657.8                1567.0
   NOX  MASS GRAMS                             6.76                 7.07                  6.59
   PARTICULATE MASS GRAMS                       .37                  .37                   .32

   HC   GRAMS/KM                                .11                  .08                   .06
   CO   GRAMS/KM                                .69                  .63                   .54
   CO2  GRAMS/KM                             326.2                268.2                 273.1
   NOX  GRAMS/KM                               1.10                 1.14                  1.15
   FUEL CONSUMPTION BY CB L/100KM             12.19                10.02                 10.20
   RUN TIME              SECONDS              505.                 867.                  505.
   MEASURED DISTANCE     KM                    5.73                 6.18                  5.74
   SCF, DRY                                     .971                 .975                  .972
COMPOSITE RESULTS
   TEST NUMBER          6172C1                                                               3-BAG       (4-BAG)
   BAROMETER    MM HG   736.6                   CARBON DIOXIDE         G/KM                  281.6      (   0.0)
   HUMIDITY     G/KG     12.2                   FUEL CONSUMPTION       L/100KM                10.52      (  0.00)
   TEMPERATURE  DEG C    23.3                   HYDROCARBONS (THC)     G/KM                     .08      (  0.00)
                                                CARBON MONOXIDE        G/KM                     .62      (  0.00)
                                                OXIDES OF NITROGEN     G/KM                    1.15      (  0.00)
                                                PARTICULATES           G/KM                    .060      ( 0.000)
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                                  FTP    VEHICLE EMISSIONS RESULTS
                                          PROJECT 11-5810-001

TEST NO.   6171-2   RUN   1                  VEHICLE NO.61                       TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300 SD           DATE    5/12/81                     ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO.  1                     DIESEL      EM-465-F
TRANSMISSION A3                              DYNO NO.      2                     ODOMETER  8332. KM( 5177. MILES)
                                             CVS NO.   3

BAROMETER 741.43 MM HG(29.19 IN HG)          DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  44. PCT                   ABS. HUMIDITY  9.5 GM/KG            NOX HUMIDITY CORRECTION FACTOR   .96
BAG RESULTS
  BAG NUMBER                                      1                  2                  3
  DESCRIPTION                               COLD TRANSIENT       STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)           569.0 (22.4)       574.0 (22.6)       569.0 (22.4)
  BLOWER INLET TEMP. DEG. C(DEG. F)          37.8 (100.0)       36.1 ( 97.0)       38.3 (101.0)
  BLOWER REVOLUTIONS                          13885.             23876.             13898.
  TOT FLOW STD. CU. METRES(SCF)             135.1 ( 4771.)     232.8 ( 8219.)     135.0 ( 4768.)
  HC  SAMPLE METER/RANGE/PPM                16.0/11/  16.      12.5/11/  13.      12.5/11/  12.
  HC  BCKGRD METER/RANGE/PPM                 9.6/ 1/  10.       8.2/ 1/   8.       7.4/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM                46.5/13/  44.      33.7/13/  31.      33.8/13/  31.
  CO  BCKGRD METER/RANGE/PPM                22.5/13/  21.      19.0/13/  17.      14.2/13/  13.
  CO2 SAMPLE METER/RANGE/PCT                44.8/ 3/  .77      25.9/ 3/  .42      37.4/ 3/  .63
  CO2 BCKGRD METER/RANGE/PCT                 3.4/ 3/  .05       3.3/ 3/  .05       3.0/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                26.7/ 2/  27.      15.2/ 2/  15.      26.0/ 2/  26.
  NOX BCKGRD METER/RANGE/PPM                  .6/ 2/   1.        .4/ 2/   0.        .6/ 2/   1.
  DILUTION FACTOR                              17.32              31.34              21.14
  HC  CONCENTRATION PPM                         7.                 5.                 5.
  CO  CONCENTRATION PPM                        23.                14.                18.
  CO2 CONCENTRATION PCT                         .72                .37                .59
  NOX CONCENTRATION PPM                        26.1               14.8               25.4
  HC  MASS GRAMS                                 .54                .62                .42
  CO  MASS GRAMS                                3.67               3.77               2.88
  CO2 MASS GRAMS                             1777.8             1595.3             1448.6
  NOX MASS GRAMS                                6.49               6.34               6.32
  PARTICULATE MASS GRAMS                        1.88               1.66               1.46

  HC  GRAMS/KM                                   .09                .10                .07
  CO  GRAMS/KM                                   .64                .61                .50
  CO2 GRAMS/KM                                307.8              257.3              250.6
  NOX GRAMS/KM                                  1.12               1.02               1.09
  FUEL CONSUMPTION BY CB L/100KM               11.50               9.62               9.36
  RUN TIME               SECONDS               506.               869.               506.
  MEASURED DISTANCE      KM                     5.78               6.20               5.78
  SCF, DRY                                       .979               .982               .980

COMPOSITE RESULTS
  TEST NUMBER            6171-2                                                              3-BAG       (4-BAG)
  BAROMETER      MM HG   741.4              CARBON DIOXIDE        G/KM                 265.9      (    0.0)
  HUMIDITY       G/KG      9.5              FUEL CONSUMPTION      L/100KM                9.94     (   0.00)
  TEMPERATURE    DEG C    26.1              HYDROCARBONS (THC)    G/KM                    .09     (   0.00)
                                            CARBON MONOXIDE       G/KM                    .58     (   0.00)
                                            OXIDES OF NITROGEN    G/KM                   1.06     (   0.00)
                                            PARTICULATES          G/KM                    .276    (  0.000)
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                                         FTP    VEHICLE EMISSIONS RESULTS
                                                  PROJECT 05-5810-001
TEST NO.   6171-3   RUN   1
VEHICLE MODEL   80 MERCEDES BENZ           VEHICLE NO.61                       TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                 DATE     5/20/81                    ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                            BAG CART NO.  1                     DIESEL     EM-465-F
                                           DYNO NO.       2                    ODOMETER  8496. KM( 5279. MILES)
                                           CVS NO.   3
BAROMETER 744.98 MM HG(29.33 IN HG)
RELATIVE HUMIDITY  37. PCT                 DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
BAG RESULTS                                ABS. HUMIDITY  7.6 GM/KG            NOX HUMIDITY CORRECTION FACTOR   .91
  BAG NUMBER                                      1                 2                 3
  DESCRIPTION                              COLD TRANSIENT      STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             701.0 (27.6)      698.5 (27.5)      698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)           574.0 (22.6)      571.5 (22.5)      571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)          36.7 ( 98.0)      35.6 ( 96.0)      37.2 ( 99.0)
  BLOWER REVOLUTIONS                           13879.            23841.            13902.
  TOT FLOW STD. CU. METRES(SCF)             136.1 ( 4804.)    234.2 ( 8268.)    136.2 ( 4809.)
  HC  SAMPLE METER/RANGE/PPM                11.9/11/  12.      8.9/11/   9.      9.0/11/   9.
  HC  BCKGRD METER/RANGE/PPM                 3.9/ 1/   4.      3.4/ 1/   3.      3.4/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                30.7/13/  28.     19.8/13/  18.     23.4/13/  21.
  CO  BCKGRD METER/RANGE/PPM                 3.8/13/   3.      3.1/13/   3.      2.1/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                44.3/ 3/  .76     25.7/ 3/  .42     37.7/ 3/  .64
  CO2 BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04      2.9/ 3/  .04      2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                27.6/ 2/  28.     15.7/ 2/  16.     26.2/ 2/  26.
  NOX BCKGRD METER/RANGE/PPM                  .7/ 2/   1.       .6/ 2/   1.       .5/ 2/   1.
  DILUTION FACTOR                              17.58             31.72             21.00
  HC  CONCENTRATION PPM                         8.                6.                6.
  CO  CONCENTRATION PPM                        24.               15.               19.
  CO2 CONCENTRATION PCT                         .72               .38               .59
  NOX CONCENTRATION PPM                        26.9              15.1              25.7
  HC  MASS GRAMS                                .65               .76               .45
  CO  MASS GRAMS                               3.85              4.09              3.02
  CO2 MASS GRAMS                             1784.7            1615.5            1482.1
  NOX MASS GRAMS                               6.37              6.15              6.09
  PARTICULATE MASS GRAMS                       2.01              1.67              1.39

  HC  GRAMS/KM                                  .11               .12               .08
  CO  GRAMS/KM                                  .66               .65               .52
  CO2 GRAMS/KM                                307.3             257.8             254.5
  NOX GRAMS/KM                                 1.10               .98              1.05
  FUEL CONSUMPTION BY CB L/100KM              11.48              9.64              9.51
  RUN TIME              SECONDS               505.              868.              506.
  MEASURED DISTANCE     KM                     5.81              6.27              5.82
  SCF, DRY                                     .981              .984              .982
COMPOSITE RESULTS
  TEST NUMBER             6171-3                                                        3-BAG      (4-BAG)
  BAROMETER     MM HG    745.0                 CARBON DIOXIDE        G/KM          267.1      (   0.0)
  HUMIDITY      G/KG       7.6                 FUEL CONSUMPTION      L/100KM         9.98     (   0.00)
  TEMPERATURE   DEG C     25.6                 HYDROCARBONS (THC)    G/KM             .11     (   0.00)
                                               CARBON MONOXIDE       G/KM             .62     (   0.00)
                                               OXIDES OF NITROGEN    G/KM            1.02     (   0.00)
                                               PARTICULATES          G/KM             .275    ( 0.000)
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                               FTP    VEHICLE EMISSIONS RESULTS
                                        PROJECT 05-5810-001

TEST NO.   6181C1   RUN   1                  VEHICLE NO.61                    TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES BENZ             DATE    5/21/81                  ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO.  1                  DIESEL     EM-465-F
TRANSMISSION A3                              DYNO NO.      2                  ODOMETER  8539. KM( 5306. MILES)
                                             CVS NO.   3

BAROMETER 741.17 MM HG(29.18 IN HG)          DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  52. PCT                   ABS. HUMIDITY 10.2 GM/KG            NOX HUMIDITY CORRECTION FACTOR   .98
BAG RESULTS
   BAG NUMBER                                      1                  2                  3
   DESCRIPTION                              COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             701.0 (27.6)       696.0 (27.4)       701.0 (27.6)
   BLOWER INLET P MM. H2O(IN. H2O)           571.5 (22.5)       569.0 (22.4)       574.0 (22.6)
   BLOWER INLET TEMP. DEG. C(DEG. F)          36.7 ( 98.0)       35.6 ( 96.0)       37.2 ( 99.0)
   BLOWER REVOLUTIONS                           13867.             23833.             13877.
   TOT FLOW STD. CU. METRES(SCF)             135.2 ( 4773.)     232.8 ( 8220.)     135.1 ( 4771.)
   HC  SAMPLE METER/RANGE/PPM                10.0/11/  10.       7.7/11/   8.        9.1/11/   9.
   HC  BCKGRD METER/RANGE/PPM                 5.0/ 1/   5.       4.5/ 1/   5.        4.5/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM                28.3/13/  26.      18.4/13/  17.       23.0/13/  21.
   CO  BCKGRD METER/RANGE/PPM                 1.6/13/   1.       1.4/13/   1.        1.7/13/   2.
   CO2 SAMPLE METER/RANGE/PCT                45.3/ 3/  .78      26.1/ 3/  .43       37.9/ 3/  .64
   CO2 BCKGRD METER/RANGE/PCT                 3.1/ 3/  .05       3.1/ 3/  .05        3.4/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                26.9/ 2/  27.      15.3/ 2/  15.       25.1/ 2/  25.
   NOX BCKGRD METER/RANGE/PPM                  .3/ 2/   0.        .5/ 2/   1.         .4/ 2/   0.
   DILUTION FACTOR                               17.16              31.22              20.88
   HC  CONCENTRATION PPM                          5.                 3.                 5.
   CO  CONCENTRATION PPM                         24.                15.                19.
   CO2 CONCENTRATION PCT                          .73                .38                .59
   NOX CONCENTRATION PPM                         26.6               14.8               24.7
   HC  MASS GRAMS                                 .41                .45                .37
   CO  MASS GRAMS                                3.75               4.09               2.98
   CO2 MASS GRAMS                              1813.0             1623.2             1457.8
   NOX MASS GRAMS                                6.77               6.49               6.29
   PARTICULATE MASS GRAMS                         .89               1.00                .71

   HC  GRAMS/KM                                   .07                .07                .06
   CO  GRAMS/KM                                   .65                .66                .52
   CO2 GRAMS/KM                                 312.6              259.9              252.7
   NOX GRAMS/KM                                  1.17               1.04               1.09
   FUEL CONSUMPTION BY CB L/100KM               11.67               9.71               9.44
   RUN TIME                 SECONDS             505.               868.               505.
   MEASURED DISTANCE        KM                   5.80               6.25               5.77
   SCF, DRY                                      .976               .979               .977

COMPOSITE RESULTS
   TEST NUMBER              618C-1                                                            3-BAG       (4-BAG)
   BAROMETER       MM HG    741.2                  CARBON DIOXIDE          G/KM              268.9       (   0.0)
   HUMIDITY        G/KG      10.2                  FUEL CONSUMPTION        L/100KM           10.04       (  0.00)
   TEMPERATURE     DEG C     24.4                  HYDROCARBONS (THC)      G/KM                .07       (  0.00)
                                                   CARBON MONOXIDE         G/KM                .62       (  0.00)
                                                   OXIDES OF NITROGEN      G/KM               1.08       (  0.00)
                                                   PARTICULATES            G/KM               .148       ( 0.000)
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                                          FTP    VEHICLE EMISSIONS RESULTS
                                                  PROJECT 05-5810-001

TEST NO.   6181C2   RUN   1                  VEHICLE NO.61                              TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES BENZ             DATE     5/22/81                           ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO.  1                            DIESEL     EM-465-F
TRANSMISSION A3                              DYNO NO.      2                            ODOMETER  8568. KM( 5324. MILES)
                                             CVS NO.    3

BAROMETER 736.85 MM HG(29.01 IN HG)          DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  50. PCT                   ABS. HUMIDITY 11.0 GM/KG                   NOX HUMIDITY CORRECTION FACTOR  1.01
BAG RESULTS
   BAG NUMBER                                     1                     2                      3
   DESCRIPTION                              COLD TRANSIENT          STABILIZED           HOT TRANSIENT           STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             696.0 (27.4)          696.0 (27.4)          696.0 (27.4)
   BLOWER INLET P MM. H2O(IN. H2O)           563.9 (22.2)          563.9 (22.2)          563.9 (22.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)          36.7 ( 98.0)          36.1 ( 97.0)          37.2 ( 99.0)
   BLOWER REVOLUTIONS                           13864.                23810.                13870.
   TOT FLOW STD. CU. METRES(SCF)             134.1 ( 4734.)        230.4 ( 8137.)        134.0 ( 4732.)
   HC  SAMPLE METER/RANGE/PPM                10.0/11/  10.           7.5/11/   8.          8.8/11/   9.
   HC  BCKGRD METER/RANGE/PPM                 4.8/ 1/   5.           4.1/ 1/   4.          3.9/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                28.8/13/  26.          17.9/13/  16.         22.3/13/  20.
   CO  BCKGRD METER/RANGE/PPM                  .9/13/   1.           1.1/13/   1.          1.2/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                45.5/ 3/  .78          25.4/ 3/  .41         37.4/ 3/  .63
   CO2 BCKGRD METER/RANGE/PCT                 3.5/ 3/  .05           3.2/ 3/  .05          3.8/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                26.2/ 2/  26.          14.5/ 2/  15.         24.9/ 2/  25.
   NOX BCKGRD METER/RANGE/PPM                  .1/ 2/   0.            .2/ 2/   0.           .6/ 2/   1.
   DILUTION FACTOR                              17.08                 32.14                 21.19
   HC  CONCENTRATION PPM                          5.                    4.                    5.
   CO  CONCENTRATION PPM                         25.                   15.                   19.
   CO2 CONCENTRATION PCT                         .73                   .37                   .57
   NOX CONCENTRATION PPM                        26.1                  14.3                  24.3
   HC  MASS GRAMS                                .42                   .47                   .39
   CO  MASS GRAMS                               3.88                  4.00                  2.93
   CO2 MASS GRAMS                             1793.2                1548.8                1408.7
   NOX MASS GRAMS                               6.76                  6.37                  6.30
   PARTICULATE MASS GRAMS                        .82                   .85                   .75

   HC  GRAMS/KM                                  .07                   .08                   .07
   CO  GRAMS/KM                                  .67                   .65                   .51
   CO2 GRAMS/KM                                310.8                 250.3                 243.4
   NOX GRAMS/KM                                 1.17                  1.03                  1.09
   FUEL CONSUMPTION BY CB L/100KM              11.61                  9.36                  9.09
   RUN TIME               SECONDS              505.                  867.                  505.
   MEASURED DISTANCE      KM                   5.77                  6.19                  5.79
   SCF, DRY                                    .977                  .980                  .978

COMPOSITE RESULTS
   TEST NUMBER            6181C2                                                                3-BAG       (4-BAG)
   BAROMETER     MM HG    736.9                         CARBON DIOXIDE        G/KM            260.9     (    0.0)
   HUMIDITY      G/KG      11.0                         FUEL CONSUMPTION      L/100KM           9.75     (   0.00)
   TEMPERATURE   DEG C     26.1                         HYDROCARBONS (THC)    G/KM              .07     (   0.00)
                                                        CARBON MONOXIDE       G/KM              .61     (   0.00)
                                                        OXIDES OF NITROGEN    G/KM             1.08     (   0.00)
                                                        PARTICULATES          G/KM             .137     (  0.000)
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                                  FTP    VEHICLE EMISSIONS RESULTS - BASELINE CHECK
                                          PROJECT 05-5810-001

TEST NO.   6191-1   RUN   1                VEHICLE NO.                                   TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE    6/29/81                               ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO.  1                               DIESEL    EM-465-F
TRANSMISSION A3                            DYNO NO.      2                               ODOMETER  8977. KM( 5578. MILES)
                                           CVS NO.   3
BAROMETER 743.71 MM HG(29.28 IN HG)        DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  57. PCT                 ABS. HUMIDITY 11.9 GM/KG                      NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
   BAG NUMBER                                  1                    2                    3
   DESCRIPTION                           COLD TRANSIENT        STABILIZED          HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          698.5 (27.5)         701.0 (27.6)         696.0 (27.4)
   BLOWER INLET P MM. H2O(IN. H2O)        571.5 (22.5)         571.5 (22.5)         566.4 (22.3)
   BLOWER INLET TEMP. DEG. C(DEG. F)       36.7 ( 98.0)         34.4 ( 94.0)         36.7 ( 98.0)
   BLOWER REVOLUTIONS                        13850.               23826.               13843.
   TOT FLOW STD. CU. METRES(SCF)          135.1 ( 4771.)       233.3 ( 8237.)       135.1 ( 4770.)
   HC  SAMPLE METER/RANGE/PPM             14.4/11/  14.        10.1/11/  10.        10.7/11/  11.
   HC  BCKGRD METER/RANGE/PPM              3.0/ 1/   3.         5.0/ 1/   5.         5.0/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM             33.3/13/  31.        20.3/13/  18.        25.0/13/  23.
   CO  BCKGRD METER/RANGE/PPM              4.4/13/   4.         3.9/13/   4.         2.8/13/   3.
   CO2 SAMPLE METER/RANGE/PCT             46.0/ 3/  .79        25.3/ 3/  .41        38.4/ 3/  .65
   CO2 BCKGRD METER/RANGE/PCT              2.9/ 3/  .04         2.6/ 3/  .04         2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM             24.0/ 2/  24.        13.1/ 2/  13.        22.4/ 2/  22.
   NOX BCKGRD METER/RANGE/PPM               .4/ 2/   0.          .3/ 2/   0.          .1/ 2/   0.
   DILUTION FACTOR                            16.86                32.24                20.57
   HC  CONCENTRATION PPM                      12.                   5.                   6.
   CO  CONCENTRATION PPM                      26.                  15.                  20.
   CO2 CONCENTRATION PCT                      .75                  .37                  .61
   NOX CONCENTRATION PPM                     23.6                 12.8                 22.3
   HC  MASS GRAMS                             .91                  .70                  .46
   CO  MASS GRAMS                            4.10                 3.98                 3.11
   CO2 MASS GRAMS                          1852.5               1598.6               1505.8
   NOX MASS GRAMS                            6.35                 5.94                 5.99
   PARTICULATE MASS GRAMS                    1.71                 1.56                 1.39

   HC  GRAMS/KM                               .16                  .11                  .08
   CO  GRAMS/KM                               .71                  .64                  .54
   CO2 GRAMS/KM                             321.2                256.8                261.3
   NOX GRAMS/KM                              1.10                  .95                 1.04
   FUEL CONSUMPTION BY CB L/100KM           12.01                 9.60                 9.76
   RUN TIME              SECONDS            504.                 868.                 504.
   MEASURED DISTANCE     KM                 5.77                 6.23                 5.76
   SCF, DRY                                 .974                 .978                 .976

COMPOSITE RESULTS
   TEST NUMBER            6191-1                                                                3-BAG      (4-BAG)
   BAROMETER    MM HG     743.7                          CARBON DIOXIDE        G/KM            271.3     (   0.0)
   HUMIDITY     G/KG       11.9                          FUEL CONSUMPTION      L/100KM         10.14     (  0.00)
   TEMPERATURE  DEG C      25.6                          HYDROCARBONS (THC)    G/KM              .11     (  0.00)
                                                         CARBON MONOXIDE       G/KM              .63     (  0.00)
                                                         OXIDES OF NITROGEN    G/KM             1.01     (  0.00)
                                                         PARTICULATES          G/KM             .257     ( 0.000)
                                  FTP    VEHICLE EMISSIONS RESULTS - W.R. GRACE RADIAL
                                          PROJECT 05-5810-111
TEST NO.   6191C1    RUN   1
VEHICLE MODEL   80 MERCEDES 300D      VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5            DATE     7/ 1/81                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                       BAG CART NO.  1                        DIESEL     EM-465-F
                                      DYNO NO.      2                        ODOMETER  9019. KM( 5604. MILES)
                                      CVS NO.   3
BAROMETER 741.93 MM HG(29.21 IN HG)
RELATIVE HUMIDITY  60. PCT            DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
BAG RESULTS                           ABS. HUMIDITY 12.2 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.05
  BAG NUMBER                                 1                  2                  3
  DESCRIPTION                         COLD TRANSIENT       STABILIZED        HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)        703.6 (27.7)       706.1 (27.8)       698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)      571.5 (22.5)       574.0 (22.6)       571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)     37.2 ( 99.0)       35.0 ( 95.0)       36.7 ( 98.0)
  BLOWER REVOLUTIONS                      13863.             23867.             13845.
  TOT FLOW STD. CU. METRES(SCF)        134.7 ( 4757.)     232.7 ( 8215.)     134.6 ( 4754.)
  HC  SAMPLE METER/RANGE/PPM           14.5/11/  15.      11.4/11/  11.      10.8/11/  11.
  HC  BCKGRD METER/RANGE/PPM            6.5/ 1/   7.       5.0/ 1/   5.       5.0/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM           31.8/13/  29.      20.5/13/  19.      24.3/13/  22.
  CO  BCKGRD METER/RANGE/PPM            5.2/13/   5.       4.5/13/   4.       3.2/13/   3.
  CO2 SAMPLE METER/RANGE/PCT           46.4/ 3/  .80      26.6/ 3/  .44      39.5/ 3/  .67
  CO2 BCKGRD METER/RANGE/PCT            3.0/ 3/  .05       3.0/ 3/  .05       3.3/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM           25.9/ 2/  26.      15.1/ 2/  15.      24.2/ 2/  24.
  NOX BCKGRD METER/RANGE/PPM             .7/ 2/   1.        .8/ 2/   1.        .6/ 2/   1.
  DILUTION FACTOR                          16.70              30.56              19.95
  HC  CONCENTRATION PPM                      8.                 7.                 6.
  CO  CONCENTRATION PPM                     24.                14.                19.
  CO2 CONCENTRATION PCT                     .75                .39                .62
  NOX CONCENTRATION PPM                    25.2               14.3               23.6
  HC  MASS GRAMS                            .65                .88                .47
  CO  MASS GRAMS                           3.76               3.87               2.95
  CO2 MASS GRAMS                         1862.2             1666.2             1529.4
  NOX MASS GRAMS                           6.83               6.69               6.39
  PARTICULATE MASS GRAMS                    .84                .85                .72

  HC  GRAMS/KM                              .11                .14                .08
  CO  GRAMS/KM                              .65                .62                .51
  CO2 GRAMS/KM                            320.5              26[illegible].8              267.1
  NOX GRAMS/KM                             1.17               1.06               1.12
  FUEL CONSUMPTION BY CB L/100KM          11.97               9.90               9.98
  RUN TIME             SECONDS             505.               869.               504.
  MEASURED DISTANCE    KM                  5.81               6.29               5.73
  SCF, DRY                                 .973               .977               .975

COMPOSITE RESULTS
  TEST NUMBER            6191C1
  BAROMETER     MM HG    741.9                                                        3-BAG      (4-BAG)
  HUMIDITY      G/KG      12.2                   CARBON DIOXIDE        G/KM           276.9     (   0.0)
  TEMPERATURE   DEG C     25.0                   FUEL CONSUMPTION      L/100KM        10.35     (  0.00)
                                                 HYDROCARBONS (THC)    G/KM             .12     (  0.00)
                                                 CARBON MONOXIDE       G/KM             .59     (  0.00)
                                                 OXIDES OF NITROGEN    G/KM            1.10     (  0.00)
                                                 PARTICULATES          G/KM            .135     ( 0.000)
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                                       FTP    VEHICLE EMISSIONS RESULTS - W.R. GRACE RADIAL
                                                PROJECT 05-5810-001
TEST NO.   6191C2    RUN   1
VEHICLE MODEL   80 MERCEDES 300D             VEHICLE NO.61
ENGINE 3.0 L(183. CID) L-5                   DATE    7/ 2/81                         TEST WEIGHT  1814. KG( 4000. LBS)
TRANSMISSION A3                              BAG CART NO. 1 / CVS NO.  3             ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
                                             DYNO NO.     2                          DIESEL    EM-465-F
BAROMETER 738.63 MM HG(29.08 IN HG)                                                  ODOMETER  9115. KM( 5664. MILES)
RELATIVE HUMIDITY  50. PCT                   DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
BAG RESULTS                                  ABS. HUMIDITY 11.0 GM/KG
  BAG NUMBER                                                                         NOX HUMIDITY CORRECTION FACTOR  1.01
  DESCRIPTION                                      1                  2                   3                  4
                                             COLD TRANSIENT      STABILIZED         HOT TRANSIENT       STABILIZED
  BLOWER DIF P MM. H2O(IN. H2O)              698.5 (27.5)       698.5 (27.5)       693.4 (27.3)       698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)            571.5 (22.5)       571.5 (22.5)       563.9 (22.2)       571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)           37.2 ( 99.0)       35.3 ( 95.5)       36.7 ( 98.0)       35.0 ( 95.0)
  BLOWER REVOLUTIONS                           13848.             23815.             13857.             23814.
  TOT FLOW STD. CU. METRES(SCF)              133.7 ( 4721.)     230.6 ( 8143.)     134.0 ( 4731.)     230.7 ( 8146.)
  HC  SAMPLE METER/RANGE/PPM                 10.4/11/  10.       7.9/11/   8.       8.7/11/   9.       8.2/11/   8.
  HC  BCKGRD METER/RANGE/PPM                  3.6/ 1/   4.       3.4/ 1/   3.       3.4/ 1/   3.       3.5/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                 27.4/13/  25.      17.5/13/  16.      23.0/13/  21.      17.7/13/  16.
  CO  BCKGRD METER/RANGE/PPM                  1.7/13/   2.       2.1/13/   2.       2.4/13/   2.       2.5/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                 46.2/ 3/  .79      26.3/ 3/  .43      39.0/ 3/  .66      25.5/ 3/  .42
  CO2 BCKGRD METER/RANGE/PCT                  3.0/ 3/  .05       3.0/ 3/  .05       3.0/ 3/  .05       3.5/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                 25.3/ 2/  25.      14.3/ 2/  14.      23.8/ 2/  24.      13.6/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                   .5/ 2/   1.        .4/ 2/   0.        .3/ 2/   0.        .4/ 2/   0.
  DILUTION FACTOR                               16.80              30.97              20.24              32.00
  HC  CONCENTRATION PPM                          7.                 5.                 5.                 5.
  CO  CONCENTRATION PPM                         23.                14.                18.                14.
  CO2 CONCENTRATION PCT                          .75                .39                .62                .36
  NOX CONCENTRATION PPM                         24.8               13.9               23.5               13.2
  HC  MASS GRAMS                                 .54                .61                .42                .64
  CO  MASS GRAMS                                3.57               3.68               2.86               3.64
  CO2 MASS GRAMS                              1838.9             1629.1             1509.9             1538.9
  NOX MASS GRAMS                                6.41               6.19               6.08               5.88
  PARTICULATE MASS GRAMS                         .70                .69                .79                .71

  HC  GRAMS/KM                                   .09                .10                .07                .10
  CO  GRAMS/KM                                   .62                .59                .49                .58
  CO2 GRAMS/KM                                 317.8              261.2              260.8              247.2
  NOX GRAMS/KM                                  1.11                .99               1.05                .94
  FUEL CONSUMPTION BY CB L/100KM               11.87               9.76               9.74               9.24

  RUN TIME               SECONDS                505.               868.               505.               868.
  MEASURED DISTANCE      KM                     5.79               6.24               5.79               6.23
  SCF, DRY                                      .976               .980               .978               .980
      DFC, WET (DRY)                                    .958 ( .942)                          .962 ( .946)
      SCF, WET (DRY)                                   1.000 ( .979)                         1.000 ( .979)
      VOL (SCM)                                               364.3                                 364.7
      SAM BLR (SCM)                                           77.27                                 77.30
      KM  (MEASURED)                                          12.02                                 12.02
      FUEL CONSUMPTION L/100KM                                10.77                                  9.48
COMPOSITE RESULTS
  TEST NUMBER            6191C2                                                                3-BAG       (4-BAG)
  BAROMETER     MM HG    738.6                   CARBON DIOXIDE          G/KM                  272.8     ( 268.7)
  HUMIDITY      G/KG      11.0                   FUEL CONSUMPTION        L/100KM               10.19     ( 10.04)
  TEMPERATURE   DEG C     26.1                   HYDROCARBONS (THC)      G/KM                    .09     (   .09)
                                                 CARBON MONOXIDE         G/KM                    .57     (   .57)
                                                 OXIDES OF NITROGEN      G/KM                   1.03     (  1.02)
                                                 PARTICULATES            G/KM                   .120     (  .121)
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APPENDIX D

PARTICULATE CONTROL SCREENING EVALUATION WITH THE OLDSMOBILE

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                              FTP   VEHICLE EMISSIONS RESULTS  - FUELS PRE-CHECK B.L.
                                     PROJECT 11-5810-001

TEST NO.   62F1-3   RUN   1             VEHICLE NO 62                      TEST WEIGHT  1928  KG( 4250  LBS)
VEHICLE MODEL   80 OLDS DELTA88         DATE    7/ 1/80                    ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350  CID) V-8              BAG CART NO.  1                    DIESEL    EM-408-F
TRANSMISSION A3                         DYNO NO.      2                    ODOMETER  7192  KM( 4469. MILES)
                                        CVS NO.   3

BAROMETER 739.45 MM HG(29.12 IN HG)     DRY BULB TEMP  27.2 DEG C(81.0 DEG F)
RELATIVE HUMIDITY  48  PCT              ABS. HUMIDITY 11.2 GM/KG           NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
  BAG NUMBER                                 1                 2                  3
  DESCRIPTION                          COLD TRANSIENT      STABILIZED       HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)         498.5 (27.5)      498.5 (27.5)      498.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)       558.8 (22.0)      558.8 (22.0)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)      36.7 ( 98.0)      37.8 (100.0)      37.8 (100.0)
  BLOWER REVOLUTIONS                      13841.            23741.            13841.
  TOT FLOW STD. CU. METRES(SCF)         134.3 ( 4742.)    230.3 ( 8131.)    134.3 ( 4742.)
  HC  SAMPLE METER/RANGE/PPM            35.3/11/  35.     20.3/11/  20.     18.5/11/  19.
  HC  BCKGRD METER/RANGE/PPM             3.0/ 1/   3.      3.0/ 1/   3.      3.0/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM            40.5/13/  37.     21.3/13/  19.     27.4/13/  25.
  CO  BCKGRD METER/RANGE/PPM              .3/13/   0.       .3/13/   0.       .6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT            46.2/ 3/  .79     29.8/ 3/  .49     40.4/ 3/  .68
  CO2 BCKGRD METER/RANGE/PCT             2.9/ 3/  .04      2.7/ 3/  .04      2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM            15.7/ 2/  16.     12.7/ 2/  13.     14.2/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM             1.3/ 2/   1.      1.0/ 2/   1.      1.0/ 2/   1.
  DILUTION FACTOR                          14.72             24.92             19.44
  HC  CONCENTRATION PPM                     32.               17.               16.
  CO  CONCENTRATION PPM                     34.               19.               23.
  CO2 CONCENTRATION PCT                      .75               .45               .65
  NOX CONCENTRATION PPM                     14.5              11.7              13.3
  HC  MASS GRAMS                             2.51              2.31              1.21
  CO  MASS GRAMS                             5.63              4.80              2.52
  CO2 MASS GRAMS                          1850.4            1914.6            1588.5
  NOX MASS GRAMS                             3.78              5.25              2.82
  PARTICULATE MASS GRAMS                     1.86              1.54              1.44

  HC  GRAMS/KM                               .43               .37               .21
  CO  GRAMS/KM                               .97               .79               .44
  CO2 GRAMS/KM                             319.4             309.2             276.6
  NOX GRAMS/KM                               .65               .85               .49
  FUEL CONSUMPTION BY CB L/100KM           12.00             11.59             10.35
  RUN TIME                 SECONDS          505.              867.              505.
  MEASURED DISTANCE        KM               5.79              6.19              5.74

COMPOSITE RESULTS
  TEST NUMBER              62F1-3
  BAROMETER       MM HG    739.4                        CARBON DIOXIDE      G/KM        3-BAG      (4-BAG)
  HUMIDITY        G/KG      11.2                        FUEL CONSUMPTION    L/100KM     302.4      (    0.0)
  TEMPERATURE     DEG C     27.2                        HYDROCARBONS (THC)  G/KM         11.34     (   0.00)
                                                        CARBON MONOXIDE     G/KM           .34     (   0.00)
                                                        OXIDES OF NITROGEN  G/KM           .78     (   0.00)
                                                        PARTICULATES        G/KM           .74     (   0.00)
                                                                                           .311    ( 0.000)
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                                              FTP    VEHICLE EMISSIONS RESULTS - FUELS PRE-CHECK B.L.
                                                       PROJECT 11-5819-001
TEST NO.   42F1-4   RUN   1
VEHICLE MODEL   80 OLDS DELTA88                      VEHICLE NO.42                       TEST WEIGHT  1928. KG/ 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                           DATE    7/ 3/80                     ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
TRANSMISSION A3                                      BAG CART NO.  1                     DIESEL     EM-408-F
                                                     DYNO NO.      2                     ODOMETER  7228  KM( 4491. MILES)
                                                     CVS NO.   3
BAROMETER 739.14 MM HG(29.10 IN HG)
RELATIVE HUMIDITY  54. PCT                           DRY BULB TEMP. 24.1 DEG C(79.0 DEG F)
BAG RESULTS                                          ABS. HUMIDITY 11.7 GM/KG
   BAG NUMBER                                                                             NOX HUMIDITY CORRECTION FACTOR  1.03
   DESCRIPTION                                             1                 2                  3
                                                      COLD TRANSIENT     STABILIZED        HOT TRANSIENT        STABILIZED
   BLOWER DIF P MM. H2O(IN. H2O)                       718.8 (28.3)      716.3 (28.2)       716.3 (28.2)
   BLOWER INLET P MM. H2O(IN. H2O)                     571.5 (22.5)      571.5 (22.5)       569.0 (22.4)
   BLOWER INLET TEMP. DEG. C(DEG. F)                    38.3 (101.0)      38.3 (101.0)       38.9 (102.0)
   BLOWER REVOLUTIONS                                     13875.            23463.             13944.
   TOT FLOW STD. CU. METRES(SCF)                       133.4 ( 4716.)    228.6 ( 8073.)     133.5 ( 4716.)
   HC  SAMPLE METER/RANGE/PPM                          38.8/11/  39.     19.5/11/  19.      14.4/11/  14.
   HC  BCKGRD METER/RANGE/PPM                           2.2/ 1/   2.      2.5/ 1/   2.       3.5/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM                          40.3/13/  37.     21.3/13/  19.      29.5/13/  27.
   CO  BCKGRD METER/RANGE/PPM                            .5/13/   0.       .4/13/   0.       1.1/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                          45.2/ 3/  .78     29.2/ 3/  .48      38.4/ 3/  .57
   CO2 BCKGRD METER/RANGE/PCT                           2.4/ 3/  .04      2.8/ 3/  .04       2.4/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                          15.2/ 2/  15.     12.3/ 2/  12.      15.3/ 2/  15.
   NOX BCKGRD METER/RANGE/PPM                            .3/ 2/   0.       .5/ 2/   1.        .4/ 2/   0.
   DILUTION FACTOR                                        17.12             27.42              19.98
   HC  CONCENTRATION PPM                                   37.               14.                14.
   CO  CONCENTRATION PPM                                   34.               18.                25.
   CO2 CONCENTRATION PCT                                   .74               .44                .53
   NOX CONCENTRATION PPM                                  14.9              11.8               14.9
   HC  MASS GRAMS                                         2.83              2.12               1.08
   CO  MASS GRAMS                                         5.54              4.87               3.88
   CO2 MASS GRAMS                                       1804.4            1842.5             1544.7
   NOX MASS GRAMS                                         3.93              5.34               3.93
  PARTICULATE MASS GRAMS                                  2.55              1.40               1.54

  HC  GRAMS/KM                                             .49               .34                .19
  CO  GRAMS/KM                                             .97               .79                .67
  CO2 GRAMS/KM                                           315.0             297.4              268.0
  NOX GRAMS/KM                                             .69               .86                .68
  FUEL CONSUMPTION BY CB L/100KM                         11.83             11.14              10.03
  RUN TIME          SECONDS                               505.              868.               505.
  MEASURED DISTANCE    KM                                 5.73              6.19               5.76
COMPOSITE RESULTS
   TEST NUMBER           42F1-4
   BAROMETER     MM HG   739.1
   HUMIDITY      G/KG     11.7                   CARBON DIOXIDE          G/KM        3-BAG       (4-BAG)
   TEMPERATURE   DEG C    24.1                   FUEL CONSUMPTION        L/100KM     293.1      (   0.0)
                                                 HYDROCARBONS (THC)      G/KM        10.98      (  0.00)
                                                 CARBON MONOXIDE         G/KM          .33      (  0.00)
                                                 OXIDES OF NITROGEN      G/KM          .79      (  0.00)
                                                 PARTICULATES            G/KM          .78      (  0.00)
                                                                                      .283      ( 0.000)
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                                      FTP    VEHICLE EMISSIONS RESULTS - NO. 1 DIESEL FUEL
                                              PROJECT 11-5810-001
TEST NO.   62F2C2   RUN   1
VEHICLE MODEL   80 OLDS DELTA88             VEHICLE NO.62
ENGINE 5.7 L(350. CID) V-8                  DATE    7/ 7/80                 TEST WEIGHT  1928. KG( 4250. LBS)
TRANSMISSION A3                             BAG CART NO.  1                 ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
                                            DYNO NO.      2                 DIESEL    EM-455-F
                                            CVS NO.    3                    ODOMETER  7273. KM( 4519. MILES)

BAROMETER 741.49 MM HG(29.20 IN HG)         DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  61. PCT                  ABS. HUMIDITY 13.2 GM/KG
BAG RESULTS                                                                 NOX HUMIDITY CORRECTION FACTOR  1.09
  BAG NUMBER                                    1                 2                 3
  DESCRIPTION                               COLD TRANSIENT     STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              714.3 (28.2)      721.4 (28.4)      718.8 (28.3)
  BLOWER INLET P MM. H2O(IN. H2O)            571.5 (22.5)      571.5 (22.5)      571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)           39.3 (101.0)      39.4 (103.0)      38.9 (102.0)
  BLOWER REVOLUTIONS                           13835.            23814.            13838.
  TOT FLOW STD. CU. METRES(SCF)              133.9 ( 4729.)    229.9 ( 8118.)    133.8 ( 4723.)
  HC  SAMPLE METER/RANGE/PPM                30.6/11/  31.     11.8/11/  12.     12.2/11/  12.
  HC  BCKGRD METER/RANGE/PPM                 3.0/ 1/   3.      3.2/ 1/   3.      3.2/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                34.6/13/  32.     18.5/13/  16.     24.4/13/  22.
  CO  BCKGRD METER/RANGE/PPM                 1.1/13/   1.       .7/13/   1.       .7/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                45.3/ 3/  .79     28.5/ 3/  .47     39.2/ 3/  .64
  CO2 BCKGRD METER/RANGE/PCT                 2.7/ 3/  .04      2.8/ 3/  .04      3.3/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                14.0/ 2/  14.     11.4/ 2/  11.     15.2/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                  .1/ 2/   0.       .1/ 2/   0.       .1/ 2/   0.
  DILUTION FACTOR                              17.11             28.40             20.11
  HC  CONCENTRATION PPM                          28.                9.                9.
  CO  CONCENTRATION PPM                          30.               15.               21.
  CO2 CONCENTRATION PCT                          .74               .43               .61
  NOX CONCENTRATION PPM                         13.9              11.3              15.1
  HC  MASS GRAMS                                2.14              1.15               .70
  CO  MASS GRAMS                                4.62              4.11              3.20
  CO2 MASS GRAMS                              1810.3            1800.4            1505.7
  NOX MASS GRAMS                                3.87              5.40              4.20
  PARTICULATE MASS GRAMS                        2.37              1.14              1.36

  HC  GRAMS/KM                                   .37               .18               .12
  CO  GRAMS/KM                                   .80               .66               .56
  CO2 GRAMS/KM                                 314.1             288.7             261.3
  NOX GRAMS/KM                                   .67               .87               .73
  FUEL CONSUMPTION BY CB L/100KM               12.30             11.28             10.20
  RUN TIME                   SECONDS            504.              869.              505.
  MEASURED DISTANCE          KM                 5.76              6.24              5.76

COMPOSITE RESULTS
  TEST NUMBER             62F2C2
  BAROMETER      MM HG     741.7
  HUMIDITY       G/KG       13.2
  TEMPERATURE    DEG C      26.1
                                                          CARBON DIOXIDE         G/KM        3-BAG      (4-BAG)
                                                          FUEL CONSUMPTION       L/100KM    284.4      (   0.0)
                                                          HYDROCARBONS (THC)     G/KM        11.20     (   0.00)
                                                          CARBON MONOXIDE        G/KM          .21     (   0.00)
                                                          OXIDES OF NITROGEN     G/KM          .66     (   0.00)
                                                          PARTICULATES           G/KM          .79     (   0.00)
                                                                                              .244     ( 0.000)
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                                    FTP    VEHICLE EMISSIONS RESULTS - NO. 1 DIESEL FUEL
                                             PROJECT 11-5810-001

TEST NO.   62F203   RUN   1                VEHICLE NO.62                    TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88            DATE    7/ 8/80                  ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO.  1                  DIESEL    EM-455-F
TRANSMISSION A3                            DYNO NO.      2                  ODOMETER  7298. KM( 4535. MILES)
                                           CVS NO.   3

BAROMETER 742.70 MM HG(29.24 IN HG)        DRY BULB TEMP. 25.4 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  57. PCT                 ABS. HUMIDITY 11.8 GM/KG         NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
   BAG NUMBER                                    1                 2                 3
   DESCRIPTION                            COLD TRANSIENT       STABILIZED       HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           714.3 (28.2)       714.3 (28.2)      714.3 (28.2)
   BLOWER INLET P MM. H2O(IN. H2O)         571.5 (22.5)       571.5 (22.5)      571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)        37.8 (100.0)       38.3 (101.0)      37.8 (100.0)
   BLOWER REVOLUTIONS                         13844.             23582.            13842.
   TOT FLOW STD. CU. METRES(SCF)           134.6 ( 4754.)     229.4 ( 8099.)    134.6 ( 4752.)
   HC  SAMPLE METER/RANGE/PPM              28.8/11/  29.      11.8/11/  12.     12.1/11/  12.
   HC  BCKGRD METER/RANGE/PPM               3.1/ 1/   3.       2.9/ 1/   3.      2.9/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM              33.1/13/  30.      18.2/13/  16.     23.8/13/  21.
   CO  BCKGRD METER/RANGE/PPM               1.0/13/   1.        .7/13/   1.       .4/13/   0.
   CO2 SAMPLE METER/RANGE/PCT              43.0/ 3/  .73      27.8/ 3/  .46     37.5/ 3/  .43
   CO2 BCKGRD METER/RANGE/PCT               2.4/ 3/  .04       2.0/ 3/  .03      2.1/ 3/  .03
   NOX SAMPLE METER/RANGE/PPM              14.5/ 2/  15.      12.1/ 2/  12.     15.3/ 2/  15.
   NOX BCKGRD METER/RANGE/PPM                .1/ 2/   0.        .1/ 2/   0.       .1/ 2/   0.
   DILUTION FACTOR                            18.12              29.17             21.11
   HC  CONCENTRATION PPM                       24.                 9.                9.
   CO  CONCENTRATION PPM                       28.                15.               20.
   CO2 CONCENTRATION PCT                       .70                .43               .40
   NOX CONCENTRATION PPM                      14.4               12.0              15.2
   HC  MASS GRAMS                             2.01               1.18               .72
   CO  MASS GRAMS                             4.44               4.04              3.18
   CO2 MASS GRAMS                           1723.3             1794.0            1480.4
   NOX MASS GRAMS                             3.85               5.47              4.06
   PARTICULATE MASS GRAMS                   . 1.74               1.15              1.13

   HC  GRAMS/KM                                .35                .19               .13
   CO  GRAMS/KM                                .78                .66               .56
   CO2 GRAMS/KM                              302.5              292.6             259.6
   NOX GRAMS/KM                                .68                .89               .71
   FUEL CONSUMPTION BY CB L/100KM            11.84              11.43             10.14
   RUN TIME               SECONDS           505.               868.              505.
   MEASURED DISTANCE      KM                5.70               6.13              5.70
COMPOSITE RESULTS
   TEST NUMBER             62F203
   BAROMETER     MM HG     742.7                                                      3-BAG        (4-BAG)
   HUMIDITY      G/KG       11.8               CARBON DIOXIDE         G/KM           285.6       (    0.0)
   TEMPERATURE   DEG C      25.6               FUEL CONSUMPTION       L/100KM        11.16       (   0.00)
                                               HYDROCARBONS (THC)     G/KM             .21       (   0.00)
                                               CARBON MONOXIDE        G/KM             .66       (   0.00)
                                               OXIDES OF NITROGEN     G/KM             .80       (   0.00)
                                               PARTICULATES           G/KM            .214       (  0.000)
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                             FTP    VEHICLE EMISSIONS RESULTS - SHALE OIL DFM LOW S.
                                     PROJECT 11-5810-001
TEST NO.   62F3C1   RUN   1
VEHICLE MODEL   80 OLDS DELTA88         VEHICLE NO.62                              TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8              DATE     7/14/80                           ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
TRANSMISSION A3                         BAG CART NO.  1                            DIESEL    EM-459-F
                                        DYNO NO.      2                            ODOMETER  7479. KM( 4647. MILES)
                                        CVS NO.   3
BAROMETER 742.19 MM HG(29.22 IN HG)
RELATIVE HUMIDITY  63. PCT              DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
BAG RESULTS                             ABS. HUMIDITY 12.3 GM/KG                   NOX HUMIDITY CORRECTION FACTOR  1.06
  BAG NUMBER                                  1                  2                  3
  DESCRIPTION                           COLD TRANSIENT      STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)          713.7 (28.1)       716.3 (28.2)       716.3 (28.2)
  BLOWER INLET P MM. H2O(IN. H2O)        569.0 (22.4)       571.5 (22.5)       571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)       37.8 (100.0)       37.2 ( 99.0)       37.8 (100.0)
  BLOWER REVOLUTIONS                        13836.             23833.             13833.
  TOT FLOW STD. CU. METRES(SCF)          134.4 ( 4746.)     231.5 ( 8175.)     134.3 ( 4744.)
  HC  SAMPLE METER/RANGE/PPM             52.1/11/  52.      26.3/11/  26.      20.3/11/  20.
  HC  BCKGRD METER/RANGE/PPM              5.6/ 1/   6.       5.0/ 1/   5.       5.0/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM             42.4/13/  39.      23.0/13/  21.      27.3/13/  25.
  CO  BCKGRD METER/RANGE/PPM               .6/13/   1.        .6/13/   1.        .6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT             44.8/ 3/  .77      29.2/ 3/  .48      39.6/ 3/  .67
  CO2 BCKGRD METER/RANGE/PCT              2.7/ 3/  .04       2.9/ 3/  .04       3.2/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM             14.0/ 2/  14.      11.0/ 2/  11.      14.4/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM               .3/ 2/   0.        .3/ 2/   0.        .4/ 2/   0.
  DILUTION FACTOR                           17.25              27.57              19.86
  HC  CONCENTRATION PPM                      47.                21.                16.
  CO  CONCENTRATION PPM                      37.                19.                23.
  CO2 CONCENTRATION PCT                      .73                .44                .62
  NOX CONCENTRATION PPM                     13.7               10.7               14.0
  HC  MASS GRAMS                             3.63               2.87               1.21
  CO  MASS GRAMS                             5.86               5.24               3.64
  CO2 MASS GRAMS                          1793.8             1859.5             1534.2
  NOX MASS GRAMS                             3.72               5.01               3.81
  PARTICULATE MASS GRAMS                     2.09               1.24               1.27

  HC  GRAMS/KM                               .63                .46                .21
  CO  GRAMS/KM                              1.02                .85                .63
  CO2 GRAMS/KM                             311.9              300.7              267.4
  NOX GRAMS/KM                               .65                .81                .66
  FUEL CONSUMPTION BY CB L/100KM           11.73              11.29              10.01
  RUN TIME               SECONDS           505.               867.               505.
  MEASURED DISTANCE      KM                 5.75               6.18               5.74
COMPOSITE RESULTS
  TEST NUMBER              62F3C1
  BAROMETER      MM HG     742.2
  HUMIDITY       G/KG       12.3
  TEMPERATURE    DEG C      24.4
                                                                                         3-BAG        (4-BAG)
                                                 CARBON DIOXIDE        G/KM              293.9      (    0.0)
                                                 FUEL CONSUMPTION      L/100KM           11.03      (   0.00)
                                                 HYDROCARBONS (THC)    G/KM                .43      (   0.00)
                                                 CARBON MONOXIDE       G/KM                .82      (   0.00)
                                                 OXIDES OF NITROGEN    G/KM                .74      (   0.00)
                                                 PARTICULATES          G/KM               .240      (  0.000)
                                        FTP    VEHICLE EMISSIONS RESULTS  - SHALE OIL DFM LOW S.
                                                 PROJECT 11-5810-001

TEST NO.    62F3C2    RUN    1                   VEHICLE NO.62                             TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL    80 OLDS DELTA88                 DATE     7/15/80                          ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                       BAG CART NO.  1                           DIESEL     EM-459-F
TRANSMISSION A3                                  DYNO NO.      2                           ODOMETER  7506. KM( 4664. MILES)
                                                 CVS NO.    3

BAROMETER 740.66 MM HG(29.16 IN HG)              DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  46. PCT                       ABS. HUMIDITY  9.7 GM/KG                  NOX HUMIDITY CORRECTION FACTOR    .97
BAG RESULTS
   BAG NUMBER                                         1                    2                    3
   DESCRIPTION                                 COLD TRANSIENT          STABILIZED          HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                711.2 (28.0)          711.2 (28.0)         711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)              569.0 (22.4)          571.5 (22.5)         563.9 (22.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)             37.8 (100.0)          37.8 (100.0)         37.8 (100.0)
   BLOWER REVOLUTIONS                              13839.                23776.               13832.
   TOT FLOW STD. CU. METRES(SCF)                134.0 ( 4732.)        230.2 ( 8129.)       134.0 ( 4730.)
   HC   SAMPLE METER/RANGE/PPM                  47.0/11/  47.         20.7/11/  21.        18.5/11/  18.
   HC   BCKGRD METER/RANGE/PPM                   4.0/ 1/   4.          3.3/ 1/   3.         3.3/ 1/   3.
   CO   SAMPLE METER/RANGE/PPM                  41.7/13/  39.         22.5/13/  20.        27.2/13/  24.
   CO   BCKGRD METER/RANGE/PPM                    .6/13/   1.           .6/13/   1.          .8/13/   1.
   CO2  SAMPLE METER/RANGE/PCT                  45.5/ 3/  .78         29.3/ 3/  .48        38.9/ 3/  .66
   CO2  BCKGRD METER/RANGE/PCT                   2.8/ 3/  .04          2.7/ 3/  .04         2.6/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM                  17.0/ 2/  17.         14.8/ 2/  15.        20.2/ 2/  20.
   NOX  BCKGRD METER/RANGE/PPM                   2.3/ 2/   2.          3.0/ 2/   3.         3.5/ 2/   4.
   DILUTION FACTOR                                  16.97                 27.50                20.26
   HC   CONCENTRATION PPM                           43.                   18.                  15.
   CO   CONCENTRATION PPM                           37.                   19.                  23.
   CO2  CONCENTRATION PCT                            .74                   .44                  .62
   NOX  CONCENTRATION PPM                          14.8                  11.9                 16.9
   HC   MASS GRAMS                                  3.34                  2.32                 1.18
   CO   MASS GRAMS                                  5.77                  5.12                 3.61
   CO2  MASS GRAMS                                1817.4                1868.9               1519.6
   NOX  MASS GRAMS                                  3.48                  5.07                 4.18
   PARTICULATE MASS GRAMS                           1.86                  1.19                 1.29

   HC   GRAMS/KM                                     .58                   .37                  .21
   CO   GRAMS/KM                                    1.00                   .82                  .63
   CO2  GRAMS/KM                                   314.7                 298.5                265.6
   NOX  GRAMS/KM                                     .64                   .81                  .73
   FUEL CONSUMPTION BY CB L/100KM                  12.02                 11.38                10.10
   RUN TIME              SECONDS                  505.                  867.                 504.
   MEASURED DISTANCE     KM                        5.78                  6.26                 5.72

COMPOSITE RESULTS
   TEST NUMBER              62F3C2                                                                       3-BAG        (4-BAG)
   BAROMETER      MM HG     740.7                            CARBON DIOXIDE        G/KM               292.9        (    0.0)
   HUMIDITY       G/KG        9.7                            FUEL CONSUMPTION      L/100KM             11.16        (   0.00)
   TEMPERATURE    DEG C      25.6                            HYDROCARBONS (THC)    G/KM                  .37        (   0.00)
                                                             CARBON MONOXIDE       G/KM                  .80        (   0.00)
                                                             OXIDES OF NITROGEN    G/KM                  .75        (   0.00)
                                                             PARTICULATES          G/KM                 .227        (  0.000)
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                                          FTP    VEHICLE EMISSIONS RESULTS - 10 PCT BUTANOL IN DF-2
                                                  PROJECT 11-5810-001

TEST NO.   62F4C1   RUN   1                       VEHICLE NO.62                           TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                   DATE    7/10/80                         ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                        BAG CART NO.  1                         DIESEL    EM-454-F
TRANSMISSION A3                                   DYNO NO.      2                         ODOMETER  7366. KM( 4577. MILES)
                                                  CVS NO.   3

BAROMETER 740.16 MM HG(29.14 IN HG)               DRY BULB TEMP. 27.8 DEG C(82.0 DEG F)
RELATIVE HUMIDITY  49. PCT                        ABS. HUMIDITY 11.7 GM/KG                NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
  BAG NUMBER                                             1                 2                 3
  DESCRIPTION                                     COLD TRANSIENT      STABILIZED       HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                    723.8 (28.5)      721.4 (28.4)      721.4 (28.4)
  BLOWER INLET P MM. H2O(IN. H2O)                  571.5 (22.5)      571.5 (22.5)      571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)                 37.2 ( 99.0)      38.9 (102.0)      38.9 (102.0)
  BLOWER REVOLUTIONS                                  13844.            23801.            13855.
  TOT FLOW STD. CU. METRES(SCF)                    134.2 ( 4738.)    230.0 ( 8120.)    133.9 ( 4727.)
  HC  SAMPLE METER/RANGE/PPM                       47.5/11/  47.     22.1/11/  22.     19.9/11/  20.
  HC  BCKGRD METER/RANGE/PPM                        2.9/ 1/   3.      2.7/ 1/   3.      2.7/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                       44.7/13/  42.     26.0/13/  23.     30.3/13/  27.
  CO  BCKGRD METER/RANGE/PPM                         .8/13/   1.      1.1/13/   1.      1.1/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                       43.9/ 3/  .75     29.1/ 3/  .48     38.6/ 3/  .65
  CO2 BCKGRD METER/RANGE/PCT                        2.7/ 3/  .04      3.0/ 3/  .05      3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                       13.8/ 2/  14.     11.3/ 2/  11.     14.8/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                         .4/ 2/   0.       .4/ 2/   0.       .6/ 2/   1.
  DILUTION FACTOR                                      17.64             27.69             20.41
  HC  CONCENTRATION PPM                                 45.               20.               17.
  CO  CONCENTRATION PPM                                 40.               22.               26.
  CO2 CONCENTRATION PCT                                 .71               .44               .61
  NOX CONCENTRATION PPM                                13.4              10.9              14.2
  HC  MASS GRAMS                                       3.46              2.59              1.34
  CO  MASS GRAMS                                       6.21              5.85              4.01
  CO2 MASS GRAMS                                     1748.9            1833.1            1486.9
  NOX MASS GRAMS                                       3.56              4.96              3.76
  PARTICULATE MASS GRAMS                               2.08              1.31              1.33

  HC  GRAMS/KM                                          .61               .42               .24
  CO  GRAMS/KM                                         1.09               .95               .71
  CO2 GRAMS/KM                                        306.4             298.1             262.1
  NOX GRAMS/KM                                          .62               .81               .66
  FUEL CONSUMPTION BY CB L/100KM                      11.89             11.54             10.12
  RUN TIME              SECONDS                        505.              868.              505.
  MEASURED DISTANCE     KM                             5.71              6.15              5.67

COMPOSITE RESULTS                                                                              3-BAG       (4-BAG)
  TEST NUMBER           62F4C1                            CARBON DIOXIDE        G/KM          290.0       (   0.0)
  BAROMETER    MM HG   740.2                              FUEL CONSUMPTION      L/100KM       11.22       (  0.00)
  HUMIDITY     G/KG     11.7                              HYDROCARBONS (THC)    G/KM            .41       (  0.00)
  TEMPERATURE  DEG C    27.8                              CARBON MONOXIDE       G/KM            .91       (  0.00)
                                                          OXIDES OF NITROGEN    G/KM            .73       (  0.00)
                                                          PARTICULATES          G/KM           .250       ( 0.000)
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                                     FTP    VEHICLE EMISSIONS RESULTS- 10 PCT BUTANOL IN DF-2
                                             PROJECT 11-5810-001

TEST NO.   62F4C2   RUN   1                VEHICLE NO.62                            TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELT 88            DATE    7/11/80                          ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO.  1                          DIESEL    EM-454-F
TRANSMISSION A3                            DYNO NO.      2                          ODOMETER  7390. KM( 4592. MILES)
                                           CVS NO.   3

BAROMETER 741.68 MM HG(29.20 IN HG)        DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  63. PCT                 ABS. HUMIDITY 12.3 GM/KG                 NOX HUMIDITY CORRECTION FACTOR  1.06
BAG RESULTS
   BAG NUMBER                                    1                   2                     3
   DESCRIPTION                           COLD TRANSIENT         STABILIZED          HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          721.4 (28.4)        716.3 (28.2)        721.4 (28.4)
   BLOWER INLET P MM. H2O(IN. H2O)        571.5 (22.5)        574.0 (22.6)        571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)       37.8 (100.0)        37.2 ( 99.0)        37.8 (100.0)
   BLOWER REVOLUTIONS                        13854.              23573.              13831.
   TOT FLOW STD. CU. METRES(SCF)          134.4 ( 4746.)      229.0 ( 8085.)      134.2 ( 4737.)
   HC  SAMPLE METER/RANGE/PPM             50.5/11/  51.       21.6/11/  22.       19.9/11/  20.
   HC  BCKGRD METER/RANGE/PPM              3.1/ 1/   3.        3.2/ 1/   3.        3.2/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM             41.6/13/  39.       23.6/13/  21.       29.6/13/  27.
   CO  BCKGRD METER/RANGE/PPM               .1/13/   0.         .1/13/   0.         .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT             44.3/ 3/  .76       29.4/ 3/  .48       39.1/ 3/  .66
   CO2 BCKGRD METER/RANGE/PCT              2.5/ 3/  .04        2.7/ 3/  .04        2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM             14.1/ 2/  14.       11.3/ 2/  11.       14.4/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM               .4/ 2/   0.         .5/ 2/   1.         .5/ 2/   1.
   DILUTION FACTOR                           17.47               27.39               20.13
   HC  CONCENTRATION PPM                      48.                 19.                 17.
   CO  CONCENTRATION PPM                      37.                 20.                 26.
   CO2 CONCENTRATION PCT                      .72                 .45                 .62
   NOX CONCENTRATION PPM                     13.7                10.8                13.9
   HC  MASS GRAMS                            3.49                2.45                1.30
   CO  MASS GRAMS                            5.81                5.44                4.03
   CO2 MASS GRAMS                          1777.5              1866.3              1527.3
   NOX MASS GRAMS                            3.73                5.01                3.78
   PARTICULATE MASS GRAMS                    2.25                1.32                1.40

   HC  GRAMS/KM                               .64                 .40                 .23
   CO  GRAMS/KM                              1.01                 .88                 .71
   CO2 GRAMS/KM                             310.0               303.5               267.5
   NOX GRAMS/KM                               .65                 .81                 .66
   FUEL CONSUMPTION BY CB L/100KM           12.02               11.74               10.32
   RUN TIME                   SECONDS        505.                862.                504.
   MEASURED DISTANCE          KM             5.73                6.15                5.71

COMPOSITE RESULTS
   TEST NUMBER             62FC42
   BAROMETER      MM HG    741.7                                                      3-BAG       (4-BAG)
   HUMIDITY       G/KG      12.3          CARBON DIOXIDE          G/KM               295.0       (   0.0)
   TEMPERATURE    DEG C     24.4          FUEL CONSUMPTION        L/100KM            11.41       (  0.00)
                                          HYDROCARBONS (THC)      G/KM                 .40       (  0.00)
                                          CARBON MONOXIDE         G/KM                 .86       (  0.00)
                                          OXIDES OF NITROGEN      G/KM                 .74       (  0.00)
                                          PARTICULATES            G/KM                .259       ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS- FUELS POST-CHECK B.L.
                                           PROJECT 11-5810-001

TEST NO.   62F1-5   RUN   1
VEHICLE MODEL    80 OLDS DELTA88               VEHICLE NO.62
ENGINE 5.7 L(350. CID) V-8                     DATE     7/17/80                 TEST WEIGHT  1928. KG( 4250. LBS)
TRANSMISSION A3                                BAG CART NO.  1                  ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
                                               DYNO NO.      2                  DIESEL    EM-408-F
                                               CVS NO.   3                      ODOMETER  7578. KM( 4709. MILES)

BAROMETER 738.89 MM HG(29.09 IN HG)            DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  49. PCT                     ABS. HUMIDITY 10.0 GM/KG
BAG RESULTS                                                                    NOX HUMIDITY CORRECTION FACTOR   .98
   BAG NUMBER                                    1                  2                 3
   DESCRIPTION                             COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            713.7 (28.1)       713.7 (28.1)      713.7 (28.1)
   BLOWER INLET P MM. H2O(IN. H2O)          571.5 (22.5)       571.5 (22.5)      571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)         36.1 ( 97.0)       38.9 (102.0)      39.4 (103.0)
   BLOWER REVOLUTIONS                         13807.             23617.            13827.
   TOT FLOW STD. CU. METRES(SCF)            133.9 ( 4729.)     228.2 ( 8058.)    133.2 ( 4705.)
   HC  SAMPLE METER/RANGE/PPM               46.4/11/  46.      22.9/11/  23.     18.0/11/  18.
   HC  BCKGRD METER/RANGE/PPM                2.9/ 1/   3.       3.4/ 1/   3.      3.4/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM               42.3/13/  39.      23.2/13/  21.     26.9/13/  24.
   CO  BCKGRD METER/RANGE/PPM                 .5/13/   0.        .7/13/   1.       .8/13/   1.
   CO2 SAMPLE METER/RANGE/PCT               45.5/ 3/  .78      28.9/ 3/  .48     38.6/ 3/  .65
   CO2 BCKGRD METER/RANGE/PCT                2.5/ 3/  .04       2.2/ 3/  .03      2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM               15.9/ 2/  16.      12.6/ 2/  13.     16.4/ 2/  16.
   NOX BCKGRD METER/RANGE/PPM                1.1/ 2/   1.       1.0/ 2/   1.      1.0/ 2/   1.
   DILUTION FACTOR                              16.97              27.89             20.43
   HC  CONCENTRATION PPM                         44.                20.               15.
   CO  CONCENTRATION PPM                         38.                20.               23.
   CO2 CONCENTRATION PCT                          .75                .44               .61
   NOX CONCENTRATION PPM                         14.9               11.6              15.4
   HC  MASS GRAMS                                 3.38               2.58              1.14
   CO  MASS GRAMS                                 5.86               5.22              3.55
   CO2 MASS GRAMS                              1927.1             1854.0            1487.1
   NOX MASS GRAMS                                 3.72               4.96              3.84
   PARTICULATE MASS GRAMS                         2.31               1.41              1.41

   HC  GRAMS/KM                                    .59                .41               .20
   CO  GRAMS/KM                                   1.02                .84               .62
   CO2 GRAMS/KM                                 317.9              297.3             260.1
   NOX GRAMS/KM                                    .65                .80               .67
   FUEL CONSUMPTION BY CB L/100KM                11.95              11.16              9.73
   RUN TIME              SECONDS                505.               867.              505.
   MEASURED DISTANCE     KM                       5.75               6.24              5.72

COMPOSITE RESULTS
   TEST NUMBER                62F1-5
   BAROMETER       MM HG      738.9
   HUMIDITY        G/KG        10.0
   TEMPERATURE     DEG C       25.0
                                                  CARBON DIOXIDE          G/KM           3-BAG        (4-BAG)
                                                  FUEL CONSUMPTION        L/100KM        281.4       (    0.0)
                                                  HYDROCARBONS (THC)      G/KM           10.93       (   0.00)
                                                  CARBON MONOXIDE         G/KM             .39       (   0.00)
                                                  OXIDES OF NITROGEN      G/KM             .82       (   0.00)
                                                  PARTICULATES            G/KM             .73       (   0.00)
                                                                                           .268      (  0.000)
                                               FTP    VEHICLE EMISSIONS RESULTS- FUELS POST-CHECK B.L.
                                                        PROJECT 11-5910-001
TEST NO.   62F1-6   RUN   1
VEHICLE MODEL   80 OLDS DELTA88                  VEHICLE NO.62
ENGINE 5.7 L(350. CID) V-8                       DATE     7/18/80                        TEST WEIGHT  1928. KG( 4250. LBS)
TRANSMISSION A3                                  BAG CART NO.  1                         ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
                                                 DYNO NO.      2                         DIESEL     EM-408-F
                                                 CVS NO.   3                             ODOMETER  7594. KM( 4719. MILES)
BAROMETER 739.65 MM HG(29.12 IN HG)
RELATIVE HUMIDITY  54. PCT                       DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
BAG RESULTS                                      ABS. HUMIDITY 10.0 GM/KG
   BAG NUMBER                                                                            NOX HUMIDITY CORRECTION FACTOR   .98
   DESCRIPTION                                         1                  2                   3
                                                COLD TRANSIENT       STABILIZED         HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                711.2 (28.0)         713.7 (28.1)       713.7 (28.1)
   BLOWER INLET P MM. H2O(IN. H2O)              569.0 (22.4)         571.5 (22.5)       571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)             37.2 ( 99.0)         36.7 ( 98.0)       36.7 ( 98.0)
   BLOWER REVOLUTIONS                              13852.               23790.              13863.
   TOT FLOW STD. CU. METRES(SCF)                134.3 ( 4742.)       230.7 ( 8146.)     134.4 ( 4747.)
   HC  SAMPLE METER/RANGE/PPM                   42.4/11/  42.        21.9/11/  22.      18.3/11/  18.
   HC  BCKGRD METER/RANGE/PPM                    3.4/ 1/   3.         3.2/ 1/   3.       3.2/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM                   41.7/13/  39.        22.3/13/  20.      27.0/13/  24.
   CO  BCKGRD METER/RANGE/PPM                    1.0/13/   1.          .8/13/   1.        .8/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                   45.7/ 3/  .78        29.2/ 3/  .48      39.4/ 3/  .67
   CO2 BCKGRD METER/RANGE/PCT                    2.7/ 3/  .04         2.6/ 3/  .04       2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                   15.1/ 2/  15.        12.1/ 2/  12.      15.8/ 2/  16.
   NOX BCKGRD METER/RANGE/PPM                     .4/ 2/   0.          .5/ 2/   1.        .4/ 2/   0.
   DILUTION FACTOR                                 16.90                27.60              19.98
   HC  CONCENTRATION PPM                            39.                  19.                15.
   CO  CONCENTRATION PPM                            37.                  19.                23.
   CO2 CONCENTRATION PCT                            .75                  .44                .62
   NOX CONCENTRATION PPM                           14.7                 11.6               15.4
   HC  MASS GRAMS                                   3.04                 2.51               1.18
   CO  MASS GRAMS                                   5.72                 5.02               3.58
   CO2 MASS GRAMS                                1834.2               1871.6             1537.0
   NOX MASS GRAMS                                   3.49                 5.01               3.87
   PARTICULATE MASS GRAMS                           2.31                 1.41               1.47

   HC  GRAMS/KM
   CO  GRAMS/KM                                     .53                  .40                .21
   CO2 GRAMS/KM                                    1.00                  .81                .62
   NOX GRAMS/KM                                   319.4                301.4              267.4
   FUEL CONSUMPTION BY CB L/100KM                   .64                  .81                .67
   RUN TIME              SECONDS                  12.00                11.31              10.01
   MEASURED DISTANCE     KM                       505.                 868.               505.
                                                  5.74                 6.21               5.75
COMPOSITE RESULTS
   TEST NUMBER            62F1-6
   BAROMETER    MM HG     739.6                                                      3-BAG       (4-BAG)
   HUMIDITY     G/KG       10.0          CARBON DIOXIDE          G/KM               295.8       (   0.0)
   TEMPERATURE  DEG C      23.3          FUEL CONSUMPTION        L/100KM             11.09       (  0.00)
                                         HYDROCARBONS (THC)      G/KM                  .38       (  0.00)
                                         CARBON MONOXIDE         G/KM                  .80       (  0.00)
                                         OXIDES OF NITROGEN      G/KM                  .74       (  0.00)
                                         PARTICULATES            G/KM                 .271       ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS - ROAD DRAFT
                                                PROJECT 11-5810-001

TEST NO.   6251C1   RUN   1                     VEHICLE NO.62                       TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                 DATE    7/22/80                     ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                      BAG CART NO.  1                     DIESEL    EM-408-F
TRANSMISSION A3                                 DYNO NO.      2                     ODOMETER  7625. KM( 4738. MILES)
                                                CVS NO.   3

BAROMETER 740.16 MM HG(29.14 IN HG)             DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  71. PCT                      ABS. HUMIDITY 14.5 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.14
BAG RESULTS
  BAG NUMBER                                         1                  2                  3
  DESCRIPTION                                 COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               716.3 (28.2)       713.7 (28.1)       716.3 (28.2)
  BLOWER INLET P MM. H2O(IN. H2O)             569.0 (22.4)       569.0 (22.4)       571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)            36.9 ( 98.5)       37.2 ( 99.0)       38.6 (101.5)
  BLOWER REVOLUTIONS                             13798.             23812.             13952.
  TOT FLOW STD. CU. METRES(SCF)               133.8 ( 4725.)     230.7 ( 8145.)     134.8 ( 4759.)
  HC  SAMPLE METER/RANGE/PPM                  52.6/11/  53.      22.9/11/  23.      20.6/11/  21.
  HC  BCKGRD METER/RANGE/PPM                   3.5/ 1/   4.       4.6/ 1/   5.       4.6/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                  43.8/13/  41.      22.3/13/  20.      26.9/13/  24.
  CO  BCKGRD METER/RANGE/PPM                   1.4/13/   1.       1.4/13/   1.        .9/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                  45.7/ 3/  .78      29.0/ 3/  .48      39.5/ 3/  .67
  CO2 BCKGRD METER/RANGE/PCT                   2.8/ 3/  .04       2.9/ 3/  .04       2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                  15.7/ 2/  16.      13.0/ 2/  13.      16.6/ 2/  17.
  NOX BCKGRD METER/RANGE/PPM                   1.4/ 2/   1.       2.0/ 2/   2.       2.2/ 2/   2.
  DILUTION FACTOR                                16.88              27.80              19.92
  HC  CONCENTRATION PPM                           49.                18.                16.
  CO  CONCENTRATION PPM                           38.                18.                23.
  CO2 CONCENTRATION PCT                           .74                .44                .63
  NOX CONCENTRATION PPM                          14.4               11.1               14.5
  HC  MASS GRAMS                                 3.80               2.46               1.26
  CO  MASS GRAMS                                 5.93               4.86               3.55
  CO2 MASS GRAMS                               1824.3             1837.6             1552.6
  NOX MASS GRAMS                                 4.20               5.57               4.27
  PARTICULATE MASS GRAMS                         2.68               1.41               1.65

  HC  GRAMS/KM                                    .66                .40                .22
  CO  GRAMS/KM                                   1.03                .79                .61
  CO2 GRAMS/KM                                  317.4              298.4              268.7
  NOX GRAMS/KM                                    .73                .90                .74
  FUEL CONSUMPTION BY CB L/100KM                11.94              11.19              10.06
  RUN TIME               SECONDS                 505.               868.               509.
  MEASURED DISTANCE      KM                      5.75               6.16               5.78

COMPOSITE RESULTS
  TEST NUMBER                6251C1
  BAROMETER     MM HG         740.2                                                          3-BAG       (4-BAG)
  HUMIDITY      G/KG           14.5                   CARBON DIOXIDE         G/KM            294.1      (    0.0)
  TEMPERATURE   DEG C          25.0                   FUEL CONSUMPTION       L/100KM         11.03      (   0.00)
                                                      HYDROCARBONS (THC)     G/KM              .40      (   0.00)
                                                      CARBON MONOXIDE        G/KM              .79      (   0.00)
                                                      OXIDES OF NITROGEN     G/KM              .82      (   0.00)
                                                      PARTICULATES           G/KM             .294      (  0.000)
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                              FTP    VEHICLE EMISSIONS RESULTS - ROAD DRAFT
                                      PROJECT 11-5810-001

TEST NO.  6251C2   RUN  1                  VEHICLE NO.62                   TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88            DATE    7/23/80                 ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO.  1                 DIESEL    EM-408-F
TRANSMISSION A3                            DYNO NO.      2                 ODOMETER  7648. KM( 4752. MILES)
                                           CVS NO.   3

BAROMETER 737.36 MM HG(29.03 IN HG)        DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  60. PCT                 ABS. HUMIDITY 12.2 GM/KG        NOX HUMIDITY CORRECTION FACTOR  1.05
BAG RESULTS
   BAG NUMBER                                    1                2                 3
   DESCRIPTION                            COLD TRANSIENT     STABILIZED       HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           708.7 (27.9)     708.7 (27.9)      708.7 (27.9)
   BLOWER INLET P MM. H2O(IN. H2O)         543.9 (22.2)     543.9 (22.2)      543.9 (22.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)        37.8 (100.0)     37.8 (100.0)      38.3 (101.0)
   BLOWER REVOLUTIONS                         13880.           23474.            13848.
   TOT FLOW STD. CU. METRES(SCF)           133.9 ( 4727.)   227.0 ( 8014.)    133.4 ( 4710.)
   HC  SAMPLE METER/RANGE/PPM              42.5/11/  42.    22.3/11/  22.     19.1/11/  19.
   HC  BCKGRD METER/RANGE/PPM               3.4/ 1/   3.     4.0/ 1/   4.      4.0/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM              41.6/13/  39.    22.0/13/  20.     26.0/13/  23.
   CO  BCKGRD METER/RANGE/PPM                .5/13/   0.      .3/13/   0.       .5/13/   0.
   CO2 SAMPLE METER/RANGE/PCT              45.6/ 3/  .78    30.0/ 3/  .50     40.2/ 3/  .68
   CO2 BCKGRD METER/RANGE/PCT               2.8/ 3/  .04     2.8/ 3/  .04      2.8/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM              17.0/ 2/  17.    14.6/ 2/  15.     18.7/ 2/  19.
   NOX BCKGRD METER/RANGE/PPM               1.4/ 2/   1.     2.9/ 2/   3.      3.2/ 2/   3.
   DILUTION FACTOR                             16.94            26.81             19.54
   HC  CONCENTRATION PPM                        39.              18.               15.
   CO  CONCENTRATION PPM                        37.              19.               22.
   CO2 CONCENTRATION PCT                        .74              .45               .64
   NOX CONCENTRATION PPM                       15.7             11.8              15.7
   HC  MASS GRAMS                              3.03             2.41              1.18
   CO  MASS GRAMS                              5.73             4.97              3.45
   CO2 MASS GRAMS                            1820.2           1888.2            1564.9
   NOX MASS GRAMS                              4.22             5.39              4.20
   PARTICULATE MASS GRAMS                      2.32             1.38              1.64

   HC  GRAMS/KM                                 .53              .39               .20
   CO  GRAMS/KM                                1.00              .80               .60
   CO2 GRAMS/KM                               314.2            305.7             270.4
   NOX GRAMS/KM                                 .73              .87               .73
   FUEL CONSUMPTION BY CB L/100KM             11.88            11.46             10.12
   RUN TIME              SECONDS               506.             866.              505.
   MEASURED DISTANCE     KM                    5.76             6.18              5.79

COMPOSITE RESULTS
   TEST NUMBER            6251C2                                                        3-BAG       (4-BAG)
   BAROMETER     MM HG     737.4                  CARBON DIOXIDE        G/KM            298.1       (   0.0)
   HUMIDITY      G/KG       12.2                  FUEL CONSUMPTION      L/100KM         11.18       (  0.00)
   TEMPERATURE   DEG C      25.0                  HYDROCARBONS (THC)    G/KM              .37       (  0.00)
                                                  CARBON MONOXIDE       G/KM              .79       (  0.00)
                                                  OXIDES OF NITROGEN    G/KM              .80       (  0.00)
                                                  PARTICULATES          G/KM             .277       ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS - CARBON CANISTER
                                                 PROJECT 11-5810-001

TEST NO.   625201    RUN   1                      VEHICLE NO.62                           TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                   DATE     7/24/80                        ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                        BAG CART NO.   1                        DIESEL      EM-408-F
TRANSMISSION A3                                   DYNO NO.       2                        ODOMETER  7665. KM( 4763. MILES)
                                                  CVS NO.    3

BAROMETER 737.36 MM HG(29.03 IN HG)               DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  56. PCT                        ABS. HUMIDITY 11.4 GM/KG                NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
  BAG NUMBER                                          1                   2                    3
  DESCRIPTION                                 COLD TRANSIENT         STABILIZED         HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                704.1 (27.8)        704.1 (27.8)        704.1 (27.8)
  BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)        563.9 (22.2)        563.9 (22.2)
  BLOWER INLET TEMP. DEG. C(DEG. F)             37.8 (100.0)        37.2 ( 99.0)        39.4 (103.0)
  BLOWER REVOLUTIONS                              13848.              23534.              13833.
  TOT FLOW STD. CU. METRES(SCF)                133.6 ( 4719.)      227.7 ( 8038.)      132.9 ( 4693.)
  HC   SAMPLE MER/RANGE/PPM                  38.2/11/  38.       20.1/11/  20.       17.7/11/  18.
  HC   BCKGRD METER/RANGE/PPM                  2.8/ 1/    3.        3.4/ 1/    3.       3.4/ 1/    3.
  CO   SAMPLE METER/RANGE/PPM                 40.7/13/  38.       22.2/13/  20.       28.7/13/  26.
  CO   BCKGRD METER/RANGE/PPM                   .7/13/    1.        .5/13/    0.        .7/13/    1.
  CO2  SAMPLE METER/RANGE/PCT                 46.7/ 3/  .80       30.2/ 3/  .50       40.4/ 3/  .69
  CO2  BCKGRD METER/RANGE/PCT                  3.1/ 3/  .05        2.7/ 3/  .04        2.9/ 3/  .04
  NOX  SAMPLE METER/RANGE/PPM                 13.4/ 2/  13.       10.4/ 2/  10.       14.1/ 2/  14.
  NOX  BCKGRD METER/RANGE/PPM                   .1/ 2/    0.        .1/ 2/    0.        .1/ 2/    0.
  DILUTION FACTOR                                 16.52               26.63               19.44
  HC   CONCENTRATION PPM                          36.                 17.                 15.
  CO   CONCENTRATION PPM                          36.                 19.                 25.
  CO2  CONCENTRATION PCT                          .76                 .46                 .64
  NOX  CONCENTRATION PPM                         13.3                10.3                14.0
  HC   MASS GRAMS                                 2.74                2.21                1.11
  CO   MASS GRAMS                                 5.57                4.99                3.79
  CO2  MASS GRAMS                              1857.6              1915.1              1564.9
  NOX  MASS GRAMS                                 3.48                4.60                3.65
  PARTICULATE MASS GRAMS                          2.30                1.41                1.51

  HC   GRAMS/KM                                    .48                 .36                 .19
  CO   GRAMS/KM                                    .97                 .80                 .66
  CO2  GRAMS/KM                                 323.2               308.3               272.5
  NOX  GRAMS/KM                                    .61                 .74                 .64
  FUEL CONSUMPTION BY CB L/100KM                 12.13               11.56               10.20
  RUN TIME              SECONDS                  505.                868.                504.
  MEASURED DISTANCE     KM                       5.75                6.21                5.74

COMPOSITE RESULTS
  TEST NUMBER              625201                                                            3-BAG        (4-BAG)
  BAROMETER     MM HG       737.4                     CARBON DIOXIDE         G/KM            301.6     (    0.0)
  HUMIDITY      G/KG         11.4                     FUEL CONSUMPTION       L/100KM          11.30     (   0.00)
  TEMPERATURE   DEG C        25.0                     HYDROCARBONS (THC)     G/KM               .34     (   0.00)
                                                      CARBON MONOXIDE        G/KM               .80     (   0.00)
                                                      OXIDES OF NITROGEN     G/KM               .68     (   0.00)
                                                      PARTICULATES           G/KM              .273     (  0.000)
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                                       FTP    VEHICLE EMISSIONS RESULTS- ROAD DRAFT POST-CHECK B.L.
                                                PROJECT 11-5810-001

TEST NO.   6252-1   RUN   1                    VEHICLE NO.62                                   TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                DATE    7/25/80                                 ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                     BAG CART NO.  1                                 DIESEL    EM-408-F
TRANSMISSION A3                                DYNO NO.      2                                 ODOMETER  7689. KM( 4778. MILES)
                                               CVS NO.   3
BAROMETER 739.65 MM HG(29.12 IN HG)
RELATIVE HUMIDITY  65. PCT                     DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
BAG RESULTS                                    ABS. HUMIDITY 11.2 GM/KG                     NOX HUMIDITY CORRECTION FACTOR  1.02
   BAG NUMBER                                          1                    2                     3
   DESCRIPTION                                 COLD TRANSIENT          STABILIZED           HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                 706.1 (27.8)          706.1 (27.8)          711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)               558.8 (22.0)          569.0 (22.4)          569.0 (22.4)
   BLOWER INLET TEMP. DEG. C(DEG. F)              36.7 ( 98.0)          35.0 ( 95.0)          37.2 ( 99.0)
   BLOWER REVOLUTIONS                                13852.                23790.                13832.
   TOT FLOW STD. CU. METRES(SCF)                 134.3 ( 4744.)        231.1 ( 8162.)        133.9 ( 4730.)
   HC  SAMPLE METER/RANGE/PPM                    47.6/11/  48.         22.7/11/  23.         20.3/11/  20.
   HC  BCKGRD METER/RANGE/PPM                     3.6/ 1/   4.          3.9/ 1/   4.          3.9/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                    42.6/13/  40.         22.8/13/  20.         27.4/13/  25.
   CO  BCKGRD METER/RANGE/PPM                     1.4/13/   1.          1.0/13/   1.          1.0/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                    47.0/ 3/  .81         29.5/ 3/  .49         40.3/ 3/  .68
   CO2 BCKGRD METER/RANGE/PCT                     3.3/ 3/  .05          2.8/ 3/  .04          3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                    15.5/ 2/  16.         12.1/ 2/  12.         15.8/ 2/  16.
   NOX BCKGRD METER/RANGE/PPM                     1.0/ 2/   1.           .6/ 2/   1.           .5/ 2/   1.
   DILUTION FACTOR                                  16.38                 27.29                 19.48
   HC  CONCENTRATION PPM                              44.                   19.                   17.
   CO  CONCENTRATION PPM                              37.                   19.                   23.
   CO2 CONCENTRATION PCT                              .76                   .45                   .64
   NOX CONCENTRATION PPM                             14.6                  11.5                  15.3
   HC  MASS GRAMS                                    3.43                  2.52                  1.28
   CO  MASS GRAMS                                    5.78                  5.09                  3.59
   CO2 MASS GRAMS                                  1874.5                1895.3                1565.3
   NOX MASS GRAMS                                    3.80                  5.17                  3.99
   PARTICULATE MASS GRAMS                            2.24                  1.46                  1.54

   HC  GRAMS/KM                                      .60                   .41                   .22
   CO  GRAMS/KM                                     1.01                   .83                   .63
   CO2 GRAMS/KM                                    325.9                 306.3                 274.9
   NOX GRAMS/KM                                      .66                   .84                   .70
   FUEL CONSUMPTION BY CB L/100KM                  12.25                 11.49                 10.29
   RUN TIME            SECONDS                     505.                  867.                  505.
   MEASURED DISTANCE   KM                          5.75                  6.16                  5.69

COMPOSITE RESULTS
   TEST NUMBER             6252-1
   BAROMETER     MM HG     739.6                      CARBON DIOXIDE         G/KM        3-BAG        (4-BAG)
   HUMIDITY      G/KG       11.2                      FUEL CONSUMPTION       L/100KM     301.7       (   0.0)
   TEMPERATURE   DEG C      22.2                      HYDROCARBONS (THC)     G/KM        11.32       (   0.00)
                                                      CARBON MONOXIDE        G/KM          .40       (   0.00)
                                                      OXIDES OF NITROGEN     G/KM          .81       (   0.00)
                                                      PARTICULATES           G/KM          .76       (   0.00)
                                                                                           .277      (  0.000)
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                                     FTP    VEHICLE EMISSIONS RESULTS - ROAD DRAFT POST-CHECK B.L.
                                              PROJECT 11-5810-001

TEST NO.   4252-2   RUN   1                   VEHICLE NO.42                            TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88               DATE    8/ 5/80                          ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                    BAG CART NO.  1                          DIESEL     EM-408-F
TRANSMISSION A3                               DYNO NO.      2                          ODOMETER  7802. KM( 4848. MILES)
                                              CVS NO.   3

BAROMETER 738.89 MM HG(29.09 IN HG)           DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  57. PCT                    ABS. HUMIDITY 11.9 GM/KG
BAG RESULTS                                                                            NOX HUMIDITY CORRECTION FACTOR  1.04
  BAG NUMBER                                       1                  2                   3
  DESCRIPTION                                COLD TRANSIENT       STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)        716.3 (28.2)        716.3 (28.2)
  BLOWER INLET P MM. H2O(IN. H2O)            558.8 (22.0)        563.9 (22.2)        563.9 (22.2)
  BLOWER INLET TEMP. DEG. C(DEG. F)           37.2 ( 99.0)        36.7 ( 98.0)        37.8 (100.0)
  BLOWER REVOLUTIONS                            13880.              23741.              13802.
  TOT FLOW STD. CU. METRES(SCF)              134.3 ( 4742.)      230.0 ( 8122.)      133.5 ( 4714.)
  HC  SAMPLE METER/RANGE/PPM                 45.1/11/  45.       26.7/11/  27.       22.5/11/  23.
  HC  BCKGRD METER/RANGE/PPM                  4.5/ 1/   5.        4.3/ 1/   4.        4.3/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                 42.8/13/  40.       25.3/13/  23.       29.3/13/  26.
  CO  BCKGRD METER/RANGE/PPM                   .5/13/   0.         .4/13/   0.         .1/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                 45.9/ 3/  .79       29.4/ 3/  .48       40.3/ 3/  .68
  CO2 BCKGRD METER/RANGE/PCT                  2.1/ 3/  .03        2.6/ 3/  .04        2.2/ 3/  .03
  NOX SAMPLE METER/RANGE/PPM                 15.8/ 2/  16.       12.3/ 2/  12.       16.1/ 2/  16.
  NOX BCKGRD METER/RANGE/PPM                   .7/ 2/   1.         .8/ 2/   1.         .7/ 2/   1.
  DILUTION FACTOR                               16.81               27.35               19.47
  HC  CONCENTRATION PPM                          41.                 23.                 18.
  CO  CONCENTRATION PPM                          38.                 22.                 24.
  CO2 CONCENTRATION PCT                          .76                 .45                 .65
  NOX CONCENTRATION PPM                         15.1                11.5                15.4
  HC  MASS GRAMS                                 3.16                3.00                1.42
  CO  MASS GRAMS                                 5.94                5.82                3.97
  CO2 MASS GRAMS                              1864.9              1881.2              1592.4
  NOX MASS GRAMS                                 4.05                5.28                4.10
  PARTICULATE MASS GRAMS                         2.58                1.52                1.51

  HC  GRAMS/KM                                   .55                 .48                 .25
  CO  GRAMS/KM                                  1.03                 .93                 .69
  CO2 GRAMS/KM                                 322.7               299.9               277.9
  NOX GRAMS/KM                                   .70                 .84                 .72
  FUEL CONSUMPTION BY CB L/100KM               12.13               11.27               10.41
  RUN TIME              SECONDS                505.                869.                505.
  MEASURED DISTANCE     KM                      5.78                6.27                5.73

COMPOSITE RESULTS
  TEST NUMBER               4252-2
  BAROMETER      MM HG       738.9                      CARBON DIOXIDE        G/KM        3-BAG      (4-BAG)
  HUMIDITY       G/KG         11.9                      FUEL CONSUMPTION      L/100KM     298.4      (   0.0)
  TEMPERATURE    DEG C        25.6                      HYDROCARBONS (THC)    G/KM        11.21      (  0.00)
                                                        CARBON MONOXIDE       G/KM          .43      (  0.00)
                                                        OXIDES OF NITROGEN    G/KM          .88      (  0.00)
                                                        PARTICULATES          G/KM          .78      (  0.00)
                                                                                           .290      ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS - CRANKCASE VENT FILTERS REMOVED
                                           PROJECT 11-5810-001

TEST NO.   6253C1   RUN   2                VEHICLE NO.62                TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88            DATE    8/ 6/80              ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO.  1              DIESEL     EM-408-F
TRANSMISSION A3                            DYNO NO.      2              ODOMETER  7821. KM( 4860. MILES)
                                           CVS NO.   3

BAROMETER 741.68 MM HG(29.20 IN HG)        DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  42. PCT                 ABS. HUMIDITY 11.8 GM/KG     NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
   BAG NUMBER                                     1                 2                 3
   DESCRIPTION                              COLD TRANSIENT     STABILIZED       HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            711.2 (28.0)      723.9 (28.5)      716.3 (28.2)
   BLOWER INLET P MM. H2O(IN. H2O)          558.8 (22.0)      571.5 (22.5)      563.9 (22.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)         36.1 ( 97.0)      36.1 ( 97.0)      37.2 ( 99.0)
   BLOWER REVOLUTIONS                          13890.            23847.            13855.
   TOT FLOW STD. CU. METRES(SCF)            135.4 ( 4780.)    232.1 ( 8196.)    134.8 ( 4760.)
   HC  SAMPLE METER/RANGE/PPM               42.9/11/  43.     25.8/11/  26.     21.4/11/  21.
   HC  BCKGRD METER/RANGE/PPM                4.5/ 1/   5.      3.5/ 1/   4.      3.5/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM               43.1/13/  40.     24.6/13/  22.     29.6/13/  27.
   CO  BCKGRD METER/RANGE/PPM                1.1/13/   1.       .3/13/   0.       .4/13/   0.
   CO2 SAMPLE METER/RANGE/PCT               47.0/ 3/  .81     29.0/ 3/  .48     40.1/ 3/  .68
   CO2 BCKGRD METER/RANGE/PCT                2.3/ 3/  .04      2.2/ 3/  .03      2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM               19.1/ 2/  19.     12.7/ 2/  13.     16.9/ 2/  17.
   NOX BCKGRD METER/RANGE/PPM                5.3/ 2/   5.      1.6/ 2/   2.      2.1/ 2/   2.
   DILUTION FACTOR                             16.39             27.77             19.58
   HC  CONCENTRATION PPM                        39.               22.               18.
   CO  CONCENTRATION PPM                        38.               21.               26.
   CO2 CONCENTRATION PCT                        .78               .45               .64
   NOX CONCENTRATION PPM                       14.1              11.2              14.9
   HC  MASS GRAMS                              3.02              3.01              1.40
   CO  MASS GRAMS                              5.95              5.71              4.01
   CO2 MASS GRAMS                            1924.6            1893.2            1587.9
   NOX MASS GRAMS                              3.80              5.14              3.99
   PARTICULATE MASS GRAMS                      2.45              1.60              1.62

   HC  GRAMS/KM                                 .52               .49               .25
   CO  GRAMS/KM                                1.03               .93               .71
   CO2 GRAMS/KM                               333.2             308.8             280.0
   NOX GRAMS/KM                                 .66               .84               .70
   FUEL CONSUMPTION BY CB L/100KM             12.52             11.60             10.49
   RUN TIME               SECONDS             505.              847.              505.
   MEASURED DISTANCE     KM                   5.78              6.13              5.67

COMPOSITE RESULTS                                                                          3-BAG      (4-BAG)
   TEST NUMBER           6253C1                              CARBON DIOXIDE       G/KM      306.0     (   0.0)
   BAROMETER     MM HG   741.7                               FUEL CONSUMPTION     L/100KM   11.49     (  0.00)
   HUMIDITY      G/KG     11.8                               HYDROCARBONS (THC)   G/KM        .43     (  0.00)
   TEMPERATURE   DEG C    23.9                               CARBON MONOXIDE      G/KM        .89     (  0.00)
                                                             OXIDES OF NITROGEN   G/KM        .76     (  0.00)
                                                             PARTICULATES         G/KM       .302     ( 0.000)
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                                          FTP    VEHICLE EMISSIONS RESULTS - VENT FILTER POST-CHECK B.L.
                                                  PROJECT 11-5810-001
TEST NO.   6252-3   RUN   1
VEHICLE MODEL   80 OLDS DELTA88                   VEHICLE NO.62                            TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                        DATE    8/ 8/80                          ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
TRANSMISSION A3                                   BAG CART NO.  1                          DIESEL     EM-408-F
                                                  DYNO NO.      2                          ODOMETER  7857. KM( 4882. MILES)
                                                  CVS NO.   3
BAROMETER 740.66 MM HG(29.16 IN HG)
RELATIVE HUMIDITY  66. PCT                        DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
BAG RESULTS                                       ABS. HUMIDITY 12.1 GM/KG                 NOX HUMIDITY CORRECTION FACTOR  1.05
  BAG NUMBER                                          1                  2                    3
  DESCRIPTION                                    COLD TRANSIENT      STABILIZED          HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                   716.3 (28.2)       563.9 (22.2)        716.3 (28.2)
  BLOWER INLET P MM. H2O(IN. H2O)                 563.9 (22.2)       716.3 (28.2)        549.0 (22.4)
  BLOWER INLET TEMP. DEG. C(DEG. F)                36.1 ( 97.0)       35.6 ( 96.0)        37.2 ( 99.0)
  BLOWER REVOLUTIONS                                  13859.             23808.              13846.
  TOT FLOW STD. CU. METRES(SCF)                   134.8 ( 4761.)     229.4 ( 8102.)      134.4 ( 4747.)
  HC  SAMPLE METER/RANGE/PPM                      45.6/11/  46.      27.2/11/  27.       24.1/11/  24.
  HC  BCKGRD METER/RANGE/PPM                       4.0/ 1/   4.       4.0/ 1/   4.        4.0/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                      44.2/13/  41.      25.5/13/  23.       29.6/13/  27.
  CO  BCKGRD METER/RANGE/PPM                       1.7/13/   1.       1.4/13/   1.         .7/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                      47.3/ 3/  .82      29.4/ 3/  .48       40.1/ 3/  .68
  CO2 BCKGRD METER/RANGE/PCT                       3.0/ 3/  .05       2.8/ 3/  .04        2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                      15.4/ 2/  15.      11.8/ 2/  12.       15.3/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                        .8/ 2/   1.        .7/ 2/   1.         .6/ 2/   1.
  DILUTION FACTOR                                     16.27              27.35               19.57
  HC  CONCENTRATION PPM                                42.                23.                 20.
  CO  CONCENTRATION PPM                                38.                21.                 25.
  CO2 CONCENTRATION PCT                                .77                .44                 .64
  NOX CONCENTRATION PPM                               14.6               11.1                14.7
  HC  MASS GRAMS                                      3.25               3.09                1.57
  CO  MASS GRAMS                                      6.01               5.62                3.96
  CO2 MASS GRAMS                                    1906.1             1843.9              1576.2
  NOX MASS GRAMS                                      3.96               5.12                3.97
  PARTICULATE MASS GRAMS                              2.50               1.51                1.53

  HC  GRAMS/KM
  CO  GRAMS/KM                                         .56                .50                 .27
  CO2 GRAMS/KM                                        1.04                .91                 .69
  NOX GRAMS/KM                                       329.7              300.9               275.0
  FUEL CONSUMPTION BY CB L/100KM                       .68                .83                 .69
  RUN TIME              SECONDS                      12.39              11.30               10.30
  MEASURED DISTANCE     KM                           505.               867.                505.
                                                     5.78               6.19                5.73
COMPOSITE RESULTS
  TEST NUMBER            6252-3
  BAROMETER     MM HG    740.7                                                  3-BAG         (4-BAG)
  HUMIDITY      G/KG      12.1                 CARBON DIOXIDE       G/KM        299.8         (   0.0)
  TEMPERATURE   DEG C     23.3                 FUEL CONSUMPTION     L/100KM      11.25        (  0.00)
                                               HYDROCARBONS (THC)   G/KM           .45        (  0.00)
                                               CARBON MONOXIDE      G/KM           .87        (  0.00)
                                               OXIDES OF NITROGEN   G/KM           .74        (  0.00)
                                               PARTICULATES         G/KM          .289        ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS - TRW ELASTOMER RINGS
                                                 PROJECT 11-5810-001

TEST NO.   6261C4   RUN   1                     VEHICLE NO.62                            TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                 DATE   10/17/80                          ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                      BAG CART NO.  1                          DIESEL    EM-408-F
TRANSMISSION A3                                 DYNO NO.      2                          ODOMETER  8135. KM( 5055. MILES)
                                                CVS NO.   3

BAROMETER 734.57 MM HG(28.92 IN HG)             DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  57. PCT                      ABS. HUMIDITY 12.0 GM/KG                 NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
  BAG NUMBER                                       1                   2                   3
  DESCRIPTION                                COLD TRANSIENT       STABILIZED         HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               708.7 (27.9)        708.7 (27.9)        708.7 (27.9)
  BLOWER INLET P MM. H2O(IN. H2O)             569.0 (22.4)        569.0 (22.4)        569.0 (22.4)
  BLOWER INLET TEMP. DEG. C(DEG. F)            37.2 ( 99.0)        37.2 ( 99.0)        37.2 ( 99.0)
  BLOWER REVOLUTIONS                             13866.              23816.              13874.
  TOT FLOW STD. CU. METRES(SCF)               133.5 ( 4715.)      229.3 ( 8098.)      133.6 ( 4718.)
  HC  SAMPLE METER/RANGE/PPM                  51.7/11/  52.       28.5/11/  29.       24.3/11/  24.
  HC  BCKGRD METER/RANGE/PPM                   7.7/ 1/   8.        5.7/ 1/   6.        5.7/ 1/   6.
  CO  SAMPLE METER/RANGE/PPM                  46.2/13/  43.       26.3/13/  24.       30.1/13/  27.
  CO  BCKGRD METER/RANGE/PPM                   4.4/13/   4.        4.2/13/   4.        2.7/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                  47.3/ 3/  .82       30.4/ 3/  .50       41.7/ 3/  .71
  CO2 BCKGRD METER/RANGE/PCT                   2.9/ 3/  .04        2.9/ 3/  .04        3.3/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                  15.1/ 2/  15.       12.5/ 2/  13.       15.8/ 2/  16.
  NOX BCKGRD METER/RANGE/PPM                   1.6/ 2/   2.        1.9/ 2/   2.        1.7/ 2/   2.
  DILUTION FACTOR                                 16.25               26.38               18.75
  HC  CONCENTRATION PPM                           44.                 23.                 19.
  CO  CONCENTRATION PPM                           38.                 20.                 24.
  CO2 CONCENTRATION PCT                           .77                 .46                 .66
  NOX CONCENTRATION PPM                          13.6                10.7                14.2
  HC  MASS GRAMS                                  3.42                3.04                1.46
  CO  MASS GRAMS                                  5.94                5.21                3.76
  CO2 MASS GRAMS                               1891.3              1931.8              1618.5
  NOX MASS GRAMS                                  3.63                4.89                3.79
  PARTICULATE MASS GRAMS                          2.71                1.49                1.59

  HC  GRAMS/KM                                    .59                 .48                 .25
  CO  GRAMS/KM                                   1.02                 .83                 .65
  CO2 GRAMS/KM                                  323.8               306.4               279.5
  NOX GRAMS/KM                                    .62                 .78                 .65
  FUEL CONSUMPTION BY CB L/100KM                12.17               11.50               10.46
  RUN TIME              SECONDS                 505.                867.                505.
  MEASURED DISTANCE     KM                      5.84                6.30                5.79

COMPOSITE RESULTS
  TEST NUMBER           6261C4                                                       3-BAG       (4-BAG)
  BAROMETER     MM HG   734.6                   CARBON DIOXIDE         G/KM          302.7      (    0.0)
  HUMIDITY      G/KG     12.0                   FUEL CONSUMPTION       L/100KM       11.36      (   0.00)
  TEMPERATURE   DEG C    25.6                   HYDROCARBONS (THC)     G/KM            .44      (   0.00)
                                                CARBON MONOXIDE        G/KM            .82      (   0.00)
                                                OXIDES OF NITROGEN     G/KM            .71      (   0.00)
                                                PARTICULATES           G/KM           .294      ( 0.000)
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                                    FTP    VEHICLE EMISSIONS RESULTS - TRW ELASTOMER RINGS
                                            PROJECT 11-5810-001

TEST NO.   6261C5   RUN   1                VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88            DATE   10/20/80                        ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO.  1                        DIESEL    EM-408-F
TRANSMISSION A3                            DYNO NO.      2                        ODOMETER  8171. KM( 5077. MILES)
                                           CVS NO.   3

BAROMETER 744.98 MM HG(29.33 IN HG)        DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  34. PCT                 ABS. HUMIDITY  7.0 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .89
BAG RESULTS
   BAG NUMBER                                    1                  2                  3
   DESCRIPTION                             COLD TRANSIENT      STABILIZED         HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            713.7 (28.1)       716.3 (28.2)       711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)          574.0 (22.6)       576.6 (22.7)       571.5 (22.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)         35.6 ( 96.0)       35.0 ( 95.0)       37.8 (100.0)
   BLOWER REVOLUTIONS                          13872.             23821.             13839.
   TOT FLOW STD. CU. METRES(SCF)            136.2 ( 4811.)     234.1 ( 8267.)     135.5 ( 4786.)
   HC  SAMPLE METER/RANGE/PPM               49.5/11/  50.      24.3/11/  24.      21.8/11/  22.
   HC  BCKGRD METER/RANGE/PPM                6.2/ 1/   6.       8.0/ 1/   8.       8.0/ 1/   8.
   CO  SAMPLE METER/RANGE/PPM               46.0/13/  43.      26.3/13/  24.      29.8/13/  27.
   CO  BCKGRD METER/RANGE/PPM                4.0/13/   3.       5.4/13/   5.       3.8/13/   3.
   CO2 SAMPLE METER/RANGE/PCT               46.9/ 3/  .81      30.6/ 3/  .51      41.2/ 3/  .70
   CO2 BCKGRD METER/RANGE/PCT                3.3/ 3/  .05       3.6/ 3/  .06       4.0/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM               16.1/ 2/  16.      12.8/ 2/  13.      16.3/ 2/  16.
   NOX BCKGRD METER/RANGE/PPM                 .8/ 2/   1.        .7/ 2/   1.        .7/ 2/   1.
   DILUTION FACTOR                              16.41              26.22              19.01
   HC  CONCENTRATION PPM                        44.                17.                14.
   CO  CONCENTRATION PPM                        39.                19.                23.
   CO2 CONCENTRATION PCT                         .76                .45                .64
   NOX CONCENTRATION PPM                        15.3               12.1               15.6
   HC  MASS GRAMS                                3.43               2.25               1.11
   CO  MASS GRAMS                                6.13               5.09               3.66
   CO2 MASS GRAMS                             1896.4             1942.9             1592.9
   NOX MASS GRAMS                                3.56               4.83               3.61
   PARTICULATE MASS GRAMS                        2.39               1.41               1.48

   HC  GRAMS/KM                                   .59                .36                .19
   CO  GRAMS/KM                                  1.05                .81                .64
   CO2 GRAMS/KM                                324.1              308.3              277.4
   NOX GRAMS/KM                                   .61                .77                .63
   FUEL CONSUMPTION BY CB L/100KM               12.18              11.56              10.38
   RUN TIME               SECONDS              505.               868.               504.
   MEASURED DISTANCE      KM                     5.85               6.30               5.74

COMPOSITE RESULTS
   TEST NUMBER             6261C5                                                      3-BAG      (4-BAG)
   BAROMETER     MM HG      745.0                   CARBON DIOXIDE        G/KM         303.1     (   0.0)
   HUMIDITY      G/KG         7.0                   FUEL CONSUMPTION      L/100KM      11.37     (  0.00)
   TEMPERATURE   DEG C       25.6                   HYDROCARBONS (THC)    G/KM           .36     (  0.00)
                                                    CARBON MONOXIDE       G/KM           .81     (  0.00)
                                                    OXIDES OF NITROGEN    G/KM           .70     (  0.00)
                                                    PARTICULATES          G/KM          .271     ( 0.000)
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                                      FTP    VEHICLE EMISSIONS RESULTS
                                              PROJECT 11-5810-001

TEST NO.   6261-1   RUN   1                  VEHICLE NO.62                              TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88              DATE    11/18/80                           ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                   BAG CART NO.  1                            DIESEL     EM-408-F
TRANSMISSION A3                              DYNO NO.      2                            ODOMETER  8266. KM( 5136. MILES)
                                             CVS NO.   3
BAROMETER 748.54 MM HG(29.47 IN HG)
RELATIVE HUMIDITY  20. PCT                   DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
BAG RESULTS                                  ABS. HUMIDITY  4.2 GM/KG                  NOX HUMIDITY CORRECTION FACTOR   .82
  BAG NUMBER                                       1                  2                    3
  DESCRIPTION                               COLD TRANSIENT       STABILIZED          HOT TRANSIENT          STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)        711.2 (28.0)         711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)           567.0 (22.4)        571.5 (22.5)         571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)          37.8 (100.0)        41.9 (107.5)         36.7 ( 98.0)
  BLOWER REVOLUTIONS                           13846.              23833.               13848.
  TOT FLOW STD. CU. METRES(SCF)             136.9 ( 4834.)      233.3 ( 8238.)       137.1 ( 4840.)
  HC  SAMPLE METER/RANGE/PPM                34.7/11/  35.       16.0/11/  16.        14.4/11/  14.
  HC  BCKGRD METER/RANGE/PPM                 2.8/ 1/   3.        3.3/ 1/   3.         3.3/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                40.2/13/  37.       20.9/13/  19.        25.3/13/  23.
  CO  BCKGRD METER/RANGE/PPM                 2.1/13/   2.        1.7/13/   2.         1.1/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                47.1/ 3/  .81       29.9/ 3/  .49        40.5/ 3/  .69
  CO2 BCKGRD METER/RANGE/PCT                 3.3/ 3/  .05        2.6/ 3/  .04         2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                17.8/ 2/  18.       14.3/ 2/  14.        17.9/ 2/  18.
  NOX BCKGRD METER/RANGE/PPM                  .6/ 2/   1.         .6/ 2/   1.          .6/ 2/   1.
  DILUTION FACTOR                              16.37               26.94                19.40
  HC  CONCENTRATION PPM                        32.                 13.                  11.
  CO  CONCENTRATION PPM                        35.                 17.                  22.
  CO2 CONCENTRATION PCT                        .76                 .46                  .65
  NOX CONCENTRATION PPM                       17.2                13.7                 17.3
  HC  MASS GRAMS                              2.53                1.73                  .89
  CO  MASS GRAMS                              5.55                4.69                 3.47
  CO2 MASS GRAMS                            1914.9              1946.1               1622.2
  NOX MASS GRAMS                              3.72                5.05                 3.74
  PARTICULATE MASS GRAMS                      2.19                1.22                 1.66

  HC  GRAMS/KM                                 .43                 .28                  .15
  CO  GRAMS/KM                                 .95                 .75                  .59
  CO2 GRAMS/KM                               328.5               310.9                276.9
  NOX GRAMS/KM                                 .64                 .81                  .64
  FUEL CONSUMPTION BY CB L/100KM             12.33               11.64                10.35
  RUN TIME              SECONDS              504.                868.                 504.
  MEASURED DISTANCE     KM                   5.83                6.26                 5.86
COMPOSITE RESULTS
  TEST NUMBER            6261-1                                                          3-BAG       (4-BAG)
  BAROMETER     MM HG   748.5                    CARBON DIOXIDE         G/KM           305.2       (    0.0)
  HUMIDITY      G/KG      4.2                    FUEL CONSUMPTION       L/100KM         11.43       (   0.00)
  TEMPERATURE   DEG C    26.1                    HYDROCARBONS (THC)     G/KM              .27       (   0.00)
                                                 CARBON MONOXIDE        G/KM              .75       (   0.00)
                                                 OXIDES OF NITROGEN     G/KM              .73       (   0.00)
                                                 PARTICULATES           G/KM             .257       ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS
                                           PROJECT 11-5810-001

TEST NO.   6261-2   RUN   1                VEHICLE NO.62                  TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88            DATE   11/17/80                ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO.  1                DIESEL    EM-408-F
TRANSMISSION A3                            DYNO NO.      2                ODOMETER  8285. KM( 5148. MILES)
                                           CVS NO.   3

BAROMETER 748.54 MM HG(29.47 IN HG)        DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  24. PCT                 ABS. HUMIDITY  4.7 GM/KG       NOX HUMIDITY CORRECTION FACTOR   .83
BAG RESULTS
  BAG NUMBER                                   1                 2                 3
  DESCRIPTION                            COLD TRANSIENT      STABILIZED      HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)           711.2 (28.0)      711.2 (28.0)      711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)         571.5 (22.5)      571.5 (22.5)      571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)        37.2 ( 99.0)      38.1 (100.5)      38.1 (100.5)
  BLOWER REVOLUTIONS                         13877.            23808.            13854.
  TOT FLOW STD. CU. METRES(SCF)           137.3 ( 4848.)    235.3 ( 8308.)    136.9 ( 4834.)
  HC  SAMPLE METER/RANGE/PPM              33.6/11/  34.     16.8/11/  17.     15.3/11/  15.
  HC  BCKGRD METER/RANGE/PPM               4.8/ 1/   5.      4.8/ 1/   5.      4.8/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM              40.7/13/  38.     22.8/13/  21.     25.2/13/  23.
  CO  BCKGRD METER/RANGE/PPM               5.7/13/   5.      4.3/13/   4.      2.8/13/   3.
  CO2 SAMPLE METER/RANGE/PCT              45.6/ 3/  .78     30.1/ 3/  .50     39.8/ 3/  .67
  CO2 BCKGRD METER/RANGE/PCT               3.5/ 3/  .05      3.2/ 3/  .05      3.2/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM              16.4/ 2/  16.     13.3/ 2/  13.     16.6/ 2/  17.
  NOX BCKGRD METER/RANGE/PPM                .3/ 2/   0.       .2/ 2/   0.       .2/ 2/   0.
  DILUTION FACTOR                            16.96             26.74             19.77
  HC  CONCENTRATION PPM                      29.               12.               11.
  CO  CONCENTRATION PPM                      32.               17.               20.
  CO2 CONCENTRATION PCT                      .73               .45               .63
  NOX CONCENTRATION PPM                     16.1              13.1              16.4
  HC  MASS GRAMS                             2.30              1.66               .85
  CO  MASS GRAMS                             5.15              4.59              3.22
  CO2 MASS GRAMS                           1841.3            1939.7            1572.7
  NOX MASS GRAMS                             3.53              4.92              3.59
  PARTICULATE MASS GRAMS                     1.93              1.37              1.50

  HC  GRAMS/KM                               .40               .27               .15
  CO  GRAMS/KM                               .89               .74               .56
  CO2 GRAMS/KM                             316.4             312.2             271.5
  NOX GRAMS/KM                               .61               .79               .62
  FUEL CONSUMPTION BY CB L/100KM            11.87             11.69             10.15
  RUN TIME               SECONDS            505.              867.              505.
  MEASURED DISTANCE      KM                 5.82              6.21              5.79

COMPOSITE RESULTS                                                                        3-BAG      (4-BAG)
  TEST NUMBER         6261-2                            CARBON DIOXIDE       G/KM       301.9      (   0.0)
  BAROMETER    MM HG  748.5                             FUEL CONSUMPTION     L/100KM    11.30      (  0.00)
  HUMIDITY     G/KG     4.7                             HYDROCARBONS (THC)   G/KM         .26      (  0.00)
  TEMPERATURE  DEG C   25.0                             CARBON MONOXIDE      G/KM         .72      (  0.00)
                                                        OXIDES OF NITROGEN   G/KM         .71      (  0.00)
                                                        PARTICULATES         G/KM        .255      ( 0.000)
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RESULTS - CORNING CATALYZED TRAP

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                                          FTP    VEHICLE EMISSIONS RESULTS
                                                  PROJECT 11-5810-001
TEST NO.   6271C1    RUN   1                    VEHICLE NO.62                                TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   79 OLDS DELTA88                 DATE   12/22/80                              ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                      BAG CART NO.  1                              DIESEL     EM-408-F
TRANSMISSION A3                                 DYNO NO.      2                              ODOMETER  8428. KM( 5237. MILES)
                                                CVS NO.    3

BAROMETER 747.27 MM HG(29.42 IN HG)             DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  26. PCT                      ABS. HUMIDITY  5.0 GM/KG                     NOX HUMIDITY CORRECTION FACTOR   .84
BAG RESULTS
  BAG NUMBER                                          1                  2                  3
  DESCRIPTION                                   COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                 711.2 (28.0)       711.2 (28.0)       713.7 (28.1)
  BLOWER INLET P MM. H2O(IN. H2O)               561.3 (22.1)       561.3 (22.1)       571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)              33.9 ( 93.0)       36.1 ( 97.0)       36.1 ( 97.0)
  BLOWER REVOLUTIONS                               13866.             23794.             13878.
  TOT FLOW STD. CU. METRES(SCF)                 136.0 ( 4802.)     232.5 ( 8209.)     135.5 ( 4783.)
  HC  SAMPLE METER/RANGE/PPM                    35.5/11/  36.      12.4/11/  12.      10.3/11/  10.
  HC  BCKGRD METER/RANGE/PPM                     4.6/ 1/   5.       3.9/ 1/   4.       3.9/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                    31.2/13/  29.      16.4/13/  15.      16.0/13/  15.
  CO  BCKGRD METER/RANGE/PPM                     1.1/13/   1.       1.4/13/   1.       1.3/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                    46.6/ 3/  .80      30.5/ 3/  .50      41.6/ 3/  .71
  CO2 BCKGRD METER/RANGE/PCT                     3.9/ 3/  .06       3.6/ 3/  .06       3.6/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM                    14.9/ 2/  15.      12.0/ 2/  12.      15.1/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                      .6/ 2/   1.        .4/ 2/   0.        .4/ 2/   0.
  DILUTION FACTOR                                  16.58              26.42              18.87
  HC  CONCENTRATION PPM                            31.                 9.                 7.
  CO  CONCENTRATION PPM                            27.                13.                13.
  CO2 CONCENTRATION PCT                             .75                .45                .66
  NOX CONCENTRATION PPM                           14.3               11.6               14.7
  HC  MASS GRAMS                                   2.45               1.16                .52
  CO  MASS GRAMS                                   4.29               3.63               2.07
  CO2 MASS GRAMS                                1856.7             1921.7             1625.2
  NOX MASS GRAMS                                   3.13               4.34               3.21
  PARTICULATE MASS GRAMS                            .61                .35                .44

  HC  GRAMS/KM                                      .43                .19                .09
  CO  GRAMS/KM                                      .75                .59                .36
  CO2 GRAMS/KM                                    324.4              311.8              283.5
  NOX GRAMS/KM                                      .55                .70                .56
  FUEL CONSUMPTION BY CB L/100KM                  12.16              11.65              10.58
  RUN TIME              SECONDS                   505.               867.               505.
  MEASURED DISTANCE     KM                        5.72               6.16               5.73

COMPOSITE RESULTS                                                                                      3-BAG       (4-BAG)
  TEST NUMBER          6271C1                                     CARBON DIOXIDE         G/KM         306.6      (   0.0)
  BAROMETER    MM HG   747.3                                      FUEL CONSUMPTION       L/100KM      11.46      (   0.00)
  HUMIDITY     G/KG      5.0                                      HYDROCARBONS (THC)     G/KM           .21      (   0.00)
  TEMPERATURE  DEG C    24.4                                      CARBON MONOXIDE        G/KM           .56      (   0.00)
                                                                  OXIDES OF NITROGEN     G/KM           .63      (   0.00)
                                                                  PARTICULATES           G/KM          .072      ( 0.000)
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RESULTS - CORNING CATALYZED TRAP

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                                 FTP    VEHICLE EMISSIONS RESULTS
                                          PROJECT 11-5810-001

TEST NO.   6271C2   RUN   1              VEHICLE NO.62                        TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   79 OLDS DELTA88          DATE   12/23/80                      ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8               BAG CART NO.  1                      DIESEL     EM-408-F
TRANSMISSION A3                          DYNO NO.      2                      ODOMETER  8888. KM( 5523. MILES)
                                         CVS NO.   3

BAROMETER 740.92 MM HG(29.17 IN HG)      DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  45. PCT               ABS. HUMIDITY  8.8 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .94
BAG RESULTS
   BAG NUMBER                                   1                  2                  3
   DESCRIPTION                            COLD TRANSIENT       STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          688.3 (27.1)       688.3 (27.1)       688.3 (27.1)
   BLOWER INLET P MM. H2O(IN. H2O)        558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)       38.9 (102.0)       40.0 (104.0)       37.8 (100.0)
   BLOWER REVOLUTIONS                        13861.             23835.             13877.
   TOT FLOW STD. CU. METRES(SCF)          105.7 ( 3731.)     181.1 ( 6395.)     106.1 ( 3748.)
   HC  SAMPLE METER/RANGE/PPM             37.2/11/  37.      14.6/11/  15.      12.0/11/  12.
   HC  BCKGRD METER/RANGE/PPM              4.1/ 1/   4.       3.9/ 1/   4.       3.9/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM             34.0/13/  31.      14.6/13/  13.      17.4/13/  16.
   CO  BCKGRD METER/RANGE/PPM               .4/13/   0.        .6/13/   1.        .9/13/   1.
   CO2 SAMPLE METER/RANGE/PCT             59.8/ 3/ 1.06      38.0/ 3/  .64      51.8/ 3/  .90
   CO2 BCKGRD METER/RANGE/PCT              3.3/ 3/  .05       3.2/ 3/  .05       3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM             18.0/ 2/  18.      13.9/ 2/  14.      17.8/ 2/  18.
   NOX BCKGRD METER/RANGE/PPM               .8/ 2/   1.        .6/ 2/   1.        .6/ 2/   1.
   DILUTION FACTOR                           12.57              20.83              14.81
   HC  CONCENTRATION PPM                     33.                11.                 8.
   CO  CONCENTRATION PPM                     30.                12.                15.
   CO2 CONCENTRATION PCT                     1.01               .59                .86
   NOX CONCENTRATION PPM                     17.3               13.3               17.2
   HC  MASS GRAMS                            2.04               1.14                .51
   CO  MASS GRAMS                            3.69               2.61               1.80
   CO2 MASS GRAMS                          1958.7             1969.7             1666.7
   NOX MASS GRAMS                            3.28               4.34               3.29
   PARTICULATE MASS GRAMS                     .94                .40                .55

   HC  GRAMS/KM                               .35                .18                .09
   CO  GRAMS/KM                               .64                .42                .31
   CO2 GRAMS/KM                             339.4              315.5              288.7
   NOX GRAMS/KM                               .57                .70                .57
   FUEL CONSUMPTION BY CB L/100KM           12.70              11.78              10.77
   RUN TIME            SECONDS              504.               867.               505.
   MEASURED DISTANCE   KM                   5.77               6.24               5.77

COMPOSITE RESULTS
   TEST NUMBER         6271C2                                                   3-BAG       (4-BAG)
   BAROMETER    MM HG  740.9            CARBON DIOXIDE         G/KM            313.1      (   0.0)
   HUMIDITY     G/KG     8.8            FUEL CONSUMPTION       L/100KM          11.69      (  0.00)
   TEMPERATURE  DEG C   24.4            HYDROCARBONS (THC)     G/KM               .19      (  0.00)
                                        CARBON MONOXIDE        G/KM               .43      (  0.00)
                                        OXIDES OF NITROGEN     G/KM               .64      (  0.00)
                                        PARTICULATES           G/KM              .093      ( 0.000)
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                              FTP    VEHICLE EMISSIONS RESULTS  - CORNING CATALYZED TRAP AT 22 kPa
                                      PROJECT 11-5810-001
TEST NO.   6271C3   RUN   1
VEHICLE MODEL   79 OLDS DELTA88           VEHICLE NO.62
ENGINE 5.7 L(350. CID) V-8                DATE    1/ 6/80                   TEST WEIGHT  1928. KG( 4250. LBS)
TRANSMISSION A3                           BAG CART NO.  1                   ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
                                          DYNO NO.      2                   DIESEL    EM-408-F
                                          CVS NO.   3                       ODOMETER  8496. KM( 5279. MILES)
BAROMETER 741.68 MM HG(29.20 IN HG)
RELATIVE HUMIDITY  44. PCT                DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
BAG RESULTS                               ABS. HUMIDITY  9.9 GM/KG           NOX HUMIDITY CORRECTION FACTOR   .97
  BAG NUMBER                                    1                 2                 3
  DESCRIPTION                            COLD TRANSIENT       STABILIZED      HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)          708.7 (27.9)      708.7 (27.9)      711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)        566.4 (22.3)      566.4 (22.3)      569.0 (22.4)
  BLOWER INLET TEMP. DEG. C(DEG. F)       37.2 ( 99.0)      37.2 ( 99.0)      37.8 (100.0)
  BLOWER REVOLUTIONS                       13874.            23788.            13871.
  TOT FLOW STD. CU. METRES(SCF)          135.3 ( 4777.)    231.9 ( 8190.)    135.1 ( 4770.)
  HC  SAMPLE METER/RANGE/PPM             29.6/11/  30.     12.7/11/  13.     12.8/11/  13.
  HC  BCKGRD METER/RANGE/PPM              7.8/ 1/   8.      7.6/ 1/   8.      7.6/ 1/   8.
  CO  SAMPLE METER/RANGE/PPM             27.7/13/  25.      7.5/13/   7.     12.5/13/  11.
  CO  BCKGRD METER/RANGE/PPM              3.2/13/   3.      2.6/13/   2.      1.9/13/   2.
  CO2 SAMPLE METER/RANGE/PCT             47.7/ 3/  .82     31.3/ 3/  .52     42.0/ 3/  .72
  CO2 BCKGRD METER/RANGE/PCT              3.6/ 3/  .06      3.4/ 3/  .05      3.8/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM             13.2/ 2/  13.     10.5/ 2/  11.     13.4/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM              1.1/ 2/   1.      1.1/ 2/   1.      1.1/ 2/   1.
  DILUTION FACTOR                          16.18             25.73             18.68
  HC  CONCENTRATION PPM                    22.                5.                6.
  CO  CONCENTRATION PPM                    22.                4.                9.
  CO2 CONCENTRATION PCT                    .77               .47               .66
  NOX CONCENTRATION PPM                   12.2               9.4              12.4
  HC  MASS GRAMS                           1.74              .72               .44
  CO  MASS GRAMS                           3.41             1.15              1.44
  CO2 MASS GRAMS                         1910.0           1990.8            1632.1
  NOX MASS GRAMS                           3.07             4.08              3.11
  PARTICULATE MASS GRAMS                   .71               .40               .53

  HC  GRAMS/KM                             .30               .12               .08
  CO  GRAMS/KM                             .59               .19               .25
  CO2 GRAMS/KM                           330.9             323.8             283.5
  NOX GRAMS/KM                             .53               .66               .54
  FUEL CONSUMPTION BY CB L/100KM          12.38             12.07             10.57
  RUN TIME              SECONDS           505.              867.              505.
  MEASURED DISTANCE     KM                5.77              6.15              5.76
COMPOSITE RESULTS
  TEST NUMBER              6271C3
  BAROMETER     MM HG       741.7                                            3-BAG      (4-BAG)
  HUMIDITY      G/KG          9.9          CARBON DIOXIDE       G/KM        314.2     (   0.0)
  TEMPERATURE   DEG C        26.7          FUEL CONSUMPTION     L/100KM     11.72     (   0.00)
                                           HYDROCARBONS (THC)   G/KM          .14     (   0.00)
                                           CARBON MONOXIDE      G/KM          .29     (   0.00)
                                           OXIDES OF NITROGEN   G/KM          .60     (   0.00)
                                           PARTICULATES         G/KM         .084     ( 0.000)
                                      FTP   VEHICLE EMISSIONS RESULTS - BASELINE CHECK
                                              PROJECT 05-5810-001

TEST NO.   6281-2   RUN   2                   VEHICLE NO.62                     TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA 88              DATE    7/ 2/81                   ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                    BAG CART NO.  1                   DIESEL    EM-465-F
TRANSMISSION A3                               DYNO NO.      2                   ODOMETER  9010. KM( 5599. MILES)
                                              CVS NO.   3

BAROMETER 739.14 MM HG(29.10 IN HG)           DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  53. PCT                    ABS. HUMIDITY 11.2 GM/KG
BAG RESULTS                                                                     NOX HUMIDITY CORRECTION FACTOR  1.02
  BAG NUMBER                                      1                  2                  3
  DESCRIPTION                               COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             693.4 (27.3)        698.5 (27.5)       693.4 (27.3)
  BLOWER INLET P MM. H2O(IN. H2O)           563.9 (22.2)        571.5 (22.5)       563.9 (22.2)
  BLOWER INLET TEMP. DEG. C(DEG. F)          36.7 ( 98.0)        36.1 ( 97.0)       36.7 ( 98.0)
  BLOWER REVOLUTIONS                           13841.              23790.             13855.
  TOT FLOW STD. CU. METRES(SCF)             134.0 ( 4732.)      230.3 ( 8133.)     134.1 ( 4736.)
  HC  SAMPLE METER/RANGE/PPM                48.0/11/  48.       17.0/11/  17.      14.9/11/  15.
  HC  BCKGRD METER/RANGE/PPM                 4.6/ 1/   5.        4.6/ 1/   5.       3.9/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                51.5/13/  49.       24.3/13/  22.      30.3/13/  28.
  CO  BCKGRD METER/RANGE/PPM                 2.2/13/   2.        2.0/13/   2.       1.8/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                48.7/ 3/  .84       31.4/ 3/  .52      43.5/ 3/  .74
  CO2 BCKGRD METER/RANGE/PCT                 3.3/ 3/  .05        2.8/ 3/  .04       2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                17.1/ 2/  17.       14.0/ 2/  14.      18.5/ 2/  19.
  NOX BCKGRD METER/RANGE/PPM                  .6/ 2/   1.         .7/ 2/   1.        .8/ 2/   1.
  DILUTION FACTOR                              15.73               25.55              17.93
  HC  CONCENTRATION PPM                         44.                 13.                11.
  CO  CONCENTRATION PPM                         45.                 20.                25.
  CO2 CONCENTRATION PCT                         .79                 .48                .70
  NOX CONCENTRATION PPM                        16.5                13.3               17.7
  HC  MASS GRAMS                               3.37                1.67               .87
  CO  MASS GRAMS                               7.06                5.34               3.98
  CO2 MASS GRAMS                             1949.9              2022.2             1729.3
  NOX MASS GRAMS                               4.31                5.97               4.63
  PARTICULATE MASS GRAMS                       2.68                1.65               1.77

  HC  GRAMS/KM                                  .58                 .27                .15
  CO  GRAMS/KM                                 1.22                 .86                .69
  CO2 GRAMS/KM                                337.3               325.7              298.4
  NOX GRAMS/KM                                  .75                 .96                .80
  FUEL CONSUMPTION BY CB L/100KM              12.69               12.20              11.16
  RUN TIME                SECONDS              505.                867.               505.
  MEASURED DISTANCE       KM                   5.78                6.21               5.80
  SCF, DRY                                     .975                .978               .976

COMPOSITE RESULTS
  TEST NUMBER           6281-2                                                            3-BAG      (4-BAG)
  BAROMETER    MM HG    739.1                CARBON DIOXIDE        G/KM                   320.6      (   0.0)
  HUMIDITY     G/KG      11.2                FUEL CONSUMPTION      L/100KM                12.01      (  0.00)
  TEMPERATURE  DEG C     25.6                HYDROCARBONS (THC)    G/KM                    .30       (  0.00)
                                             CARBON MONOXIDE       G/KM                    .89       (  0.00)
                                             OXIDES OF NITROGEN    G/KM                    .87       (  0.00)
                                             PARTICULATES          G/KM                    .318      ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS - JOHNSON MATTHEY CATALYZED TRAP
                                                PROJECT 05-5810-001

TEST NO.   6281C1   RUN   1                     VEHICLE NO.62                   TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA 88                DATE    7/ 8/81                 ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                      BAG CART NO.  1                 DIESEL    EM-465-F
TRANSMISSION A3                                 DYNO NO.       2                ODOMETER  9049. KM( 5623. MILES)
                                                CVS NO.   3

BAROMETER 744.98 MM HG(29.33 IN HG)             DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  46. PCT                      ABS. HUMIDITY  9.2 GM/KG        NOX HUMIDITY CORRECTION FACTOR   .95
BAG RESULTS
  BAG NUMBER                                         1               2               3
  DESCRIPTION                                 COLD TRANSIENT     STABILIZED     HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                690.9 (27.2)     706.1 (27.8)    698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)              566.4 (22.3)     576.6 (22.7)    571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)             35.6 ( 96.0)     33.9 ( 93.0)    36.7 ( 98.0)
  BLOWER REVOLUTIONS                              13861.           23809.          13854.
  TOT FLOW STD. CU. METRES(SCF)                135.8 ( 4795.)   233.7 ( 8252.)  135.4 ( 4781.)
  HC  SAMPLE METER/RANGE/PPM                   33.6/11/  34.     6.7/11/   7.    6.5/11/   7.
  HC  BCKGRD METER/RANGE/PPM                    5.9/ 1/   6.     5.2/ 1/   5.    4.9/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                   30.3/13/  28.     4.7/13/   4.    6.4/13/   6.
  CO  BCKGRD METER/RANGE/PPM                    2.1/13/   2.     1.9/13/   2.    1.6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                   46.0/ 3/  .79    31.5/ 3/  .52   42.1/ 3/  .72
  CO2 BCKGRD METER/RANGE/PCT                    3.3/ 3/  .05     3.1/ 3/  .05    3.8/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM                   15.1/ 2/  15.    12.7/ 2/  13.   16.9/ 2/  17.
  NOX BCKGRD METER/RANGE/PPM                     .6/ 2/   1.      .6/ 2/   1.     .8/ 2/   1.
  DILUTION FACTOR                                 16.82            25.59           18.66
  HC  CONCENTRATION PPM                           28.               2.              2.
  CO  CONCENTRATION PPM                           25.               3.              4.
  CO2 CONCENTRATION PCT                           .74              .48             .66
  NOX CONCENTRATION PPM                          14.5             12.1            16.1
  HC  MASS GRAMS                                  2.20              .23             .15
  CO  MASS GRAMS                                  4.00              .68             .67
  CO2 MASS GRAMS                                1847.2           2040.4          1640.6
  NOX MASS GRAMS                                  3.60             5.17            3.99
  PARTICULATE MASS GRAMS                          1.10              .83             .74

  HC  GRAMS/KM                                     .38              .04             .03
  CO  GRAMS/KM                                     .70              .11             .12
  CO2 GRAMS/KM                                  321.6            328.3           286.6
  NOX GRAMS/KM                                     .63              .83             .70
  FUEL CONSUMPTION BY CB L/100KM                 12.05            12.22           10.67
  RUN TIME              SECONDS                 505.             868.            505.
  MEASURED DISTANCE     KM                        5.74             6.22            5.72
  SCF, DRY                                        .978             .980            .979

COMPOSITE RESULTS                                                                   3-BAG      (4-BAG)
  TEST NUMBER           6281C1                   CARBON DIOXIDE       G/KM        315.5      (   0.0)
  BAROMETER    MM HG    745.0                    FUEL CONSUMPTION     L/100KM      11.76     (  0.00)
  HUMIDITY     G/KG       9.2                    HYDROCARBONS (THC)   G/KM           .11     (  0.00)
  TEMPERATURE  DEG C     25.0                    CARBON MONOXIDE      G/KM           .23     (  0.00)
                                                 OXIDES OF NITROGEN   G/KM           .75     (  0.00)
                                                 PARTICULATES         G/KM          .144     ( 0.000)
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                                         FTP    VEHICLE EMISSIONS RESULTS - JOHNSON MATTHEY CATALYZED TRAP
                                                  PROJECT 05-5810-001
TEST NO.   6281C2   RUN   1
VEHICLE MODEL   80 OLDS DELTA 88            VEHICLE NO.62                                 TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                  DATE     7/ 9/81                              ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
TRANSMISSION A3                             BAG CART NO. 1 / CVS NO.  3                   DIESEL     EM-465-F
                                            DYNO NO.       2                              ODOMETER  9128. KM( 5672. MILES)
BAROMETER 744.22 MM HG(29.30 IN HG)
RELATIVE HUMIDITY  52. PCT                  DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
BAG RESULTS                                 ABS. HUMIDITY 10.2 GM/KG                      NOX HUMIDITY CORRECTION FACTOR   .78
  BAG NUMBER                                       1                  2                     3                   4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED           HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             708.7 (27.9)        706.1 (27.8)         701.0 (27.6)        703.6 (27.7)
  BLOWER INLET P MM. H2O(IN. H2O)           579.1 (22.8)        579.1 (22.8)         574.0 (22.6)        574.0 (22.6)
  BLOWER INLET TEMP. DEG. C(DEG. F)          35.0 ( 95.0)        33.9 ( 93.0)         37.2 ( 99.0)        36.1 ( 97.0)
  BLOWER REVOLUTIONS                          13854.              23810.               13845.              23801.
  TOT FLOW STD. CU. METRES(SCF)             135.5 ( 4786.)      233.4 ( 8242.)       135.1 ( 4769.)      232.6 ( 8212.)
  HC  SAMPLE METER/RANGE/PPM                35.4/11/  35.         6.8/11/   7.         6.7/11/   7.        6.7/11/   7.
  HC  BCKGRD METER/RANGE/PPM                 4.8/ 1/   5.         4.2/ 1/   4.         4.2/ 1/   4.        4.0/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                35.7/13/  33.         7.2/13/   6.         9.5/13/   9.        6.8/13/   6.
  CO  BCKGRD METER/RANGE/PPM                 1.8/13/   2.         1.6/13/   1.         1.4/13/   1.        1.3/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                47.2/ 3/  .81        29.9/ 3/  .49        42.1/ 3/  .72       29.6/ 3/  .49
  CO2 BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04         3.2/ 3/  .05         3.2/ 3/  .05        3.0/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                15.4/ 2/  15.        12.0/ 2/  12.        16.5/ 2/  17.       12.3/ 2/  12.
  NOX BCKGRD METER/RANGE/PPM                  .5/ 2/   1.          .3/ 2/   0.          .3/ 2/   0.         .3/ 2/   0.
  DILUTION FACTOR                              16.34               27.06                18.65               27.36
  HC  CONCENTRATION PPM                        31.                  3.                   3.                  3.
  CO  CONCENTRATION PPM                        30.                  5.                   7.                  5.
  CO2 CONCENTRATION PCT                        .77                 .45                  .67                 .44
  NOX CONCENTRATION PPM                       14.9                11.7                 16.2                12.0
  HC  MASS GRAMS                               2.41                .37                  .21                 .38
  CO  MASS GRAMS                               4.81               1.35                 1.12                1.32
  CO2 MASS GRAMS                             1915.1             1909.0               1658.3              1891.8
  NOX MASS GRAMS                               3.80               5.14                 4.12                5.25
  PARTICULATE MASS GRAMS                       1.09                .69                  .77                 .66

  HC  GRAMS/KM                                 .42                 .06                  .04                 .06
  CO  GRAMS/KM                                 .84                 .22                  .20                 .21
  CO2 GRAMS/KM                               334.2               310.8                288.7               303.2
  NOX GRAMS/KM                                 .66                 .84                  .72                 .84
  FUEL CONSUMPTION BY CB L/100KM              12.53               11.58                10.75               11.30

  RUN TIME               SECONDS              505.                868.                 505.                868.
  MEASURED DISTANCE      KM                   5.73                6.14                 5.74                6.24
  SCF, DRY                                    .976                .979                 .977                .979
       DFC, WET (DRY)                                .954 ( .938)                                .957 ( .941)
       SCF, WET (DRY)                               1.000 ( .978)                               1.000 ( .978)
       VOL (SCM)                                           369.0                                      367.6
       SAM BLR (SCM)                                       78.84                                      78.84
       KM  (MEASURED)                                      11.87                                      11.98
       FUEL CONSUMPTION L/100KM                            12.04                                      11.04
COMPOSITE RESULTS
   TEST NUMBER              6281C2
   BAROMETER      MM HG     744.2                          CARBON DIOXIDE          G/KM         3-BAG       (4-BAG)
   HUMIDITY       G/KG       10.2                          FUEL CONSUMPTION        L/100KM      309.6      ( 307.4)
   TEMPERATURE    DEG C      24.4                          HYDROCARBONS (THC)      G/KM         11.55      ( 11.47)
                                                           CARBON MONOXIDE         G/KM           .13      (   .13)
                                                           OXIDES OF NITROGEN      G/KM           .34      (   .34)
                                                           PARTICULATES            G/KM           .77      (   .77)
                                                                                                 .135      (  .133)
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                                  FTP    VEHICLE EMISSIONS RESULTS  - JOHNSON MATTHEY CATALYZED TRAP
                                           PROJECT 05-5810-001

TEST NO.   6282C3    RUN   1              VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88           DATE     7/24/81                       ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                BAG CART NO.  1                        DIESEL     EM-465-F
TRANSMISSION A3                           DYNO NO.      2                        ODOMETER  9516. KM( 5913. MILES)
                                          CVS NO.   3

BAROMETER 739.90 MM HG(29.13 IN HG)       DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  46. PCT                ABS. HUMIDITY  9.3 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .96
BAG RESULTS
  BAG NUMBER                                      1                 2                  3
  DESCRIPTION                              COLD TRANSIENT      STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             698.5 (27.5)      703.6 (27.7)      698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)           571.5 (22.5)      576.6 (22.7)      571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)          34.4 ( 94.0)      33.9 ( 93.0)      36.7 ( 98.0)
  BLOWER REVOLUTIONS                          13849.            23800.            13852.
  TOT FLOW STD. CU. METRES(SCF)             134.6 ( 4751.)    231.4 ( 8170.)    134.1 ( 4735.)
  HC  SAMPLE METER/RANGE/PPM                12.5/11/  12.      4.9/11/   5.      5.9/11/   6.
  HC  BCKGRD METER/RANGE/PPM                 4.9/ 1/   5.      4.5/ 1/   5.      4.5/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                22.3/13/  20.      5.2/13/   5.      7.5/13/   7.
  CO  BCKGRD METER/RANGE/PPM                  .6/13/   1.       .8/13/   1.      1.1/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                46.7/ 3/  .80     31.0/ 3/  .51     42.3/ 3/  .72
  CO2 BCKGRD METER/RANGE/PCT                 2.7/ 3/  .04      2.8/ 3/  .04      3.3/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                17.1/ 2/  17.     13.4/ 2/  13.     17.4/ 2/  17.
  NOX BCKGRD METER/RANGE/PPM                  .4/ 2/   0.       .4/ 2/   0.       .4/ 2/   0.
  DILUTION FACTOR                              16.60             26.05             18.56
  HC  CONCENTRATION PPM                          8.                1.                2.
  CO  CONCENTRATION PPM                         19.                4.                6.
  CO2 CONCENTRATION PCT                         .77               .47               .67
  NOX CONCENTRATION PPM                        16.7              13.0              17.0
  HC  MASS GRAMS                                .61               .07               .12
  CO  MASS GRAMS                               3.01              1.05               .88
  CO2 MASS GRAMS                             1884.8            2000.9            1651.8
  NOX MASS GRAMS                               4.11              5.51              4.17
  PARTICULATE MASS GRAMS                        .85               .74               .81

  HC  GRAMS/KM                                  .11               .01               .02
  CO  GRAMS/KM                                  .52               .17               .15
  CO2 GRAMS/KM                                326.5             323.6             285.6
  NOX GRAMS/KM                                  .71               .89               .72
  FUEL CONSUMPTION BY CB L/100KM              12.19             12.05             10.63
  RUN TIME               SECONDS               505.              868.              505.
  MEASURED DISTANCE      KM                    5.77              6.18              5.78
  SCF, DRY                                     .978              .980              .979

COMPOSITE RESULTS
  TEST NUMBER           6282C3                                                              3-BAG       (4-BAG)
  BAROMETER    MM HG    739.9                   CARBON DIOXIDE         G/KM                 313.8       (   0.0)
  HUMIDITY     G/KG       9.3                   FUEL CONSUMPTION       L/100KM              11.69       (  0.00)
  TEMPERATURE  DEG C     25.0                   HYDROCARBONS (THC)     G/KM                   .03       (  0.00)
                                                CARBON MONOXIDE        G/KM                   .24       (  0.00)
                                                OXIDES OF NITROGEN     G/KM                   .81       (  0.00)
                                                PARTICULATES           G/KM                  .131       ( 0.000)
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                              FTP    VEHICLE EMISSIONS RESULTS
                                      PROJECT 05-5810-001

TEST NO.   6200-3   RUN   1                    VEHICLE NO.62                               TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                DATE     9/10/81                            ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                     BAG CART NO. 1 / CVS NO.  3                 DIESEL     EM-487-F
TRANSMISSION A3                                DYNO NO.      2                             ODOMETER  9782. KM( 6078. MILES)

BAROMETER 741.43 MM HG(29.19 IN HG)            DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  53. PCT                     ABS. HUMIDITY 10.7 GM/KG                    NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                                        1                    2                    3                     4
  DESCRIPTION                                 COLD TRANSIENT         STABILIZED         HOT TRANSIENT           STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               698.5 (27.5)        703.6 (27.7)        698.5 (27.5)         703.6 (27.7)
  BLOWER INLET P MM. H2O(IN. H2O)             571.5 (22.5)        576.6 (22.7)        571.5 (22.5)         576.6 (22.7)
  BLOWER INLET TEMP. DEG. C(DEG. F)            36.7 ( 98.0)        36.1 ( 97.0)        37.2 ( 99.0)         36.7 ( 98.0)
  BLOWER REVOLUTIONS                            13862.               23780.              13860.               23812.
  TOT FLOW STD. CU. METRES(SCF)               135.1 ( 4769.)      231.8 ( 8185.)      135.0 ( 4766.)       231.9 ( 8190.)
  HC  SAMPLE METER/RANGE/PPM                  30.5/11/  30.       16.9/11/  17.       15.7/11/  16.        17.4/11/  17.
  HC  BCKGRD METER/RANGE/PPM                   5.7/ 1/   6.        5.0/ 1/   5.        5.0/ 1/   5.         5.0/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                  41.7/13/  39.       25.5/13/  23.       28.9/13/  27.        23.3/13/  21.
  CO  BCKGRD METER/RANGE/PPM                   6.8/13/   6.        5.9/13/   5.        4.6/13/   4.         3.8/13/   3.
  CO2 SAMPLE METER/RANGE/PCT                  46.3/ 3/  .80       30.6/ 3/  .51       41.9/ 3/  .71        30.0/ 3/  .50
  CO2 BCKGRD METER/RANGE/PCT                   3.2/ 3/  .05        2.9/ 3/  .04        3.4/ 3/  .05         3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                  17.8/ 2/  18.       13.8/ 2/  14.       19.0/ 2/  19.        14.2/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                    .3/ 2/   0.         .3/ 2/   0.         .4/ 2/   0.          .5/ 2/   1.
  DILUTION FACTOR                                16.69               26.26               18.68                26.83
  HC  CONCENTRATION PPM                          25.                 12.                 11.                  13.
  CO  CONCENTRATION PPM                          32.                 18.                 22.                  17.
  CO2 CONCENTRATION PCT                          .75                 .46                 .66                  .45
  NOX CONCENTRATION PPM                          17.5                13.5                18.6                 13.7
  HC  MASS GRAMS                                 1.95                1.61                 .86                 1.68
  CO  MASS GRAMS                                 5.03                4.77                3.43                 4.72
  CO2 MASS GRAMS                               1855.2              1967.8              1640.4               1910.8
  NOX MASS GRAMS                                 4.52                5.99                4.80                 6.08
  PARTICULATE MASS GRAMS                         2.00                1.42                1.52                 1.41

  HC  GRAMS/KM                                   .34                 .26                 .15                  .27
  CO  GRAMS/KM                                   .88                 .78                 .60                  .77
  CO2 GRAMS/KM                                 323.2               320.4               285.0                310.1
  NOX GRAMS/KM                                   .79                 .97                 .83                  .99
  FUEL CONSUMPTION BY CB L/100KM               12.11               11.99               10.65                11.61

  RUN TIME               SECONDS                505.                866.                505.                 867.
  MEASURED DISTANCE      KM                     5.74                6.14                5.76                 6.16
  SCF, DRY                                      .976                .978                .976                 .978
       DFC, WET (DRY)                                  .954 ( .938)                            .957 ( .941)
       SCF, WET (DRY)                                 1.000 ( .977)                           1.000 ( .978)
       VOL (SCM)                                             366.9                                   366.9
       SAM BLR (SCM)                                         78.12                                   78.17
       KM  (MEASURED)                                        11.88                                   11.92
       FUEL CONSUMPTION L/100KM                              12.05                                   11.15

COMPOSITE RESULTS                                                                                  3-BAG       (4-BAG)
  TEST NUMBER           6200-3                                  CARBON DIOXIDE         G/KM        311.2      ( 308.2)
  BAROMETER     MM HG   741.4                                   FUEL CONSUMPTION       L/100KM     11.65      ( 11.54)
  HUMIDITY      G/KG     10.7                                   HYDROCARBONS (THC)     G/KM         .25       (   .25)
  TEMPERATURE   DEG C    25.0                                   CARBON MONOXIDE        G/KM         .75       (   .74)
                                                                OXIDES OF NITROGEN     G/KM         .90       (   .90)
                                                                PARTICULATES           G/KM        .265       (  .264)
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                                    FTP    VEHICLE EMISSIONS RESULTS
                                            PROJECT 05-5810-001

TEST NO.   6200-4    RUN   1                VEHICLE NO.62
VEHICLE MODEL    80 OLDS DELTA88            DATE     9/11/81                     TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                  BAG CART NO. 1 / CVS NO.  3          ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
TRANSMISSION A3                             DYNO NO.      2                      DIESEL     EM-487-F
                                                                                 ODOMETER  9850. KM( 6120. MILES)
BAROMETER 742.44 MM HG(29.23 IN HG)         DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  52. PCT                  ABS. HUMIDITY 10.2 GM/KG
BAG RESULTS                                                                      NOX HUMIDITY CORRECTION FACTOR   .98
  BAG NUMBER                                      1                  2                  3                  4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             703.6 (27.7)       703.6 (27.7)       703.6 (27.7)       703.6 (27.7)
  BLOWER INLET P MM. H2O(IN. H2O)           576.6 (22.7)       576.6 (22.7)       576.6 (22.7)       576.6 (22.7)
  BLOWER INLET TEMP. DEG. C(DEG. F)          35.6 ( 96.0)       35.6 ( 96.0)       37.2 ( 99.0)       36.7 ( 98.0)
  BLOWER REVOLUTIONS                           13875.             23807.             13853.             23802.
  TOT FLOW STD. CU. METRES(SCF)             135.5 ( 4786.)     232.6 ( 8212.)     135.0 ( 4768.)     232.2 ( 8199.)
  HC  SAMPLE METER/RANGE/PPM                34.3/11/  34.      16.3/11/  16.      15.0/11/  15.      17.2/11/  17.
  HC  BCKGRD METER/RANGE/PPM                 6.0/ 1/   6.       5.3/ 1/   5.       5.3/ 1/   5.       5.8/ 1/   6.
  CO  SAMPLE METER/RANGE/PPM                42.6/13/  40.      24.4/13/  22.      28.2/13/  26.      23.7/13/  22.
  CO  BCKGRD METER/RANGE/PPM                 7.1/13/   6.       6.3/13/   6.       5.0/13/   5.       4.3/13/   4.
  CO2 SAMPLE METER/RANGE/PCT                46.3/ 3/  .80      31.2/ 3/  .52      41.1/ 3/  .70      30.1/ 3/  .50
  CO2 BCKGRD METER/RANGE/PCT                 3.1/ 3/  .05       3.1/ 3/  .05       3.4/ 3/  .05       3.2/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                17.4/ 2/  17.      14.1/ 2/  14.      18.0/ 2/  18.      13.9/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                  .5/ 2/   1.        .6/ 2/   1.        .7/ 2/   1.        .7/ 2/   1.
  DILUTION FACTOR                              16.68              25.73              19.08              26.73
  HC   CONCENTRATION PPM                       29.                11.                10.                12.
  CO   CONCENTRATION PPM                       33.                16.                21.                17.
  CO2  CONCENTRATION PCT                        .75                .47                .65                .45
  NOX  CONCENTRATION PPM                      16.9               13.5               17.3               13.2
  HC   MASS GRAMS                              2.24               1.50                .78               1.55
  CO   MASS GRAMS                              5.14               4.42               3.28               4.71
  CO2  MASS GRAMS                           1865.1             2007.6             1604.2             1914.3
  NOX  MASS GRAMS                              4.32               5.92               4.40               5.78
  PARTICULATE MASS GRAMS                       2.61               1.60               1.65               1.49

  HC   GRAMS/KM                                 .39                .24                .13                .25
  CO   GRAMS/KM                                 .89                .71                .57                .76
  CO2  GRAMS/KM                              321.4              320.3              277.7              311.1
  NOX  GRAMS/KM                                 .74                .94                .76                .94
  FUEL CONSUMPTION BY CB L/100KM              12.05              11.98              10.38              11.65

  RUN TIME                  SECONDS           505.               867.               505.               867.
  MEASURED DISTANCE         KM                5.80               6.27               5.78               6.15
  SCF, DRY                                    .976               .978               .977               .979
       DFC, WET (DRY)                                 .953 ( .937)                         .957 ( .941)
       SCF, WET (DRY)                                1.000 ( .977)                        1.000 ( .978)
       VOL (SCM)                                            368.1                                367.3
       SAM BLR (SCM)                                        78.32                                78.31
       KM  (MEASURED)                                       12.07                                11.93
       FUEL CONSUMPTION L/100KM                             12.02                                11.03

COMPOSITE RESULTS
  TEST NUMBER              6200-4                                                        3-BAG        (4-BAG)
  BAROMETER      MM HG     742.4                    CARBON DIOXIDE          G/KM         308.9       ( 306.1)
  HUMIDITY       G/KG       10.2                    FUEL CONSUMPTION        L/100KM      11.56       ( 11.46)
  TEMPERATURE    DEG C      24.4                    HYDROCARBONS (THC)      G/KM           .24       (   .24)
                                                    CARBON MONOXIDE         G/KM           .71       (   .72)
                                                    OXIDES OF NITROGEN      G/KM           .85       (   .85)
                                                    PARTICULATES            G/KM          .304       (  .300)
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                                     FTP    VEHICLE EMISSIONS RESULTS
                                             PROJECT 05-5810-001

TEST NO.   6200T2   RUN   1                 VEHICLE NO.62                        TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88             DATE     9/16/81                     ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                  BAG CART NO. 1 / CVS NO.  3          DIESEL     EM-487-F
TRANSMISSION A3                             DYNO NO.      2                      ODOMETER 10009. KM( 6219. MILES)

BAROMETER 743.97 MM HG(29.29 IN HG)         DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  47. PCT                  ABS. HUMIDITY 10.2 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .98
BAG RESULTS
   BAG NUMBER                                      1                  2                   3                  4
   DESCRIPTION                              COLD TRANSIENT      STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            698.5 (27.5)        703.6 (27.7)       698.5 (27.5)        703.6 (27.7)
   BLOWER INLET P MM. H2O(IN. H2O)          571.5 (22.5)        576.6 (22.7)       571.5 (22.5)        576.6 (22.7)
   BLOWER INLET TEMP. DEG. C(DEG. F)         35.6 ( 96.0)        34.4 ( 94.0)       36.7 ( 98.0)        35.6 ( 96.0)
   BLOWER REVOLUTIONS                          13854.              23808.             13833.              23818.
   TOT FLOW STD. CU. METRES(SCF)            135.6 ( 4790.)      233.4 ( 8242.)     135.2 ( 4773.)      233.0 ( 8228.)
   HC  SAMPLE METER/RANGE/PPM               15.4/11/  15.        5.1/11/   5.       5.9/11/   6.        5.0/11/   5.
   HC  BCKGRD METER/RANGE/PPM                5.0/ 1/   5.        4.1/ 1/   4.       4.1/ 1/   4.        4.0/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM               22.2/13/  20.        2.4/13/   2.       6.0/13/   5.        2.7/13/   2.
   CO  BCKGRD METER/RANGE/PPM                 .1/13/   0.         .1/13/   0.        .3/13/   0.         .5/13/   0.
   CO2 SAMPLE METER/RANGE/PCT               46.2/ 3/  .79       30.5/ 3/  .50      41.7/ 3/  .71       30.1/ 3/  .50
   CO2 BCKGRD METER/RANGE/PCT                3.1/ 3/  .05        2.8/ 3/  .04       2.8/ 3/  .04        2.7/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM               17.4/ 2/  17.       13.3/ 2/  13.      18.0/ 2/  18.       13.0/ 2/  13.
   NOX BCKGRD METER/RANGE/PPM                 .6/ 2/   1.        1.5/ 2/   2.        .9/ 2/   1.         .8/ 2/   1.
   DILUTION FACTOR                              16.80               26.52              18.86               26.90
   HC  CONCENTRATION PPM                        11.                  1.                 2.                  1.
   CO  CONCENTRATION PPM                        20.                  2.                 5.                  2.
   CO2 CONCENTRATION PCT                         .75                 .46                .67                 .46
   NOX CONCENTRATION PPM                        16.8                11.9               17.1                12.2
   HC  MASS GRAMS                                .84                 .15                .16                 .15
   CO  MASS GRAMS                               3.09                 .55                .79                 .53
   CO2 MASS GRAMS                             1861.9              1980.1             1655.4              1952.6
   NOX MASS GRAMS                               4.29                5.20               4.35                5.35
   PARTICULATE MASS GRAMS                        .81                 .58                .59                 .53

   HC  GRAMS/KM                                  .15                 .03                .03                 .02
   CO  GRAMS/KM                                  .54                 .09                .14                 .09
   CO2 GRAMS/KM                                324.6               322.3              288.8               315.7
   NOX GRAMS/KM                                  .75                 .85                .76                 .87
   FUEL CONSUMPTION BY CB L/100KM              12.12               12.00              10.75               11.75

   RUN TIME              SECONDS               505.                868.               504.                868.
   MEASURED DISTANCE     KM                    5.74                6.14               5.73                6.19
   SCF, DRY                                    .977                .980               .978                .980
         DFC, WET (DRY)                                 .954 ( .940)                           .957 ( .942)
         SCF, WET (DRY)                                1.000 ( .979)                          1.000 ( .980)
         VOL (SCM)                                             369.1                                  368.2
         SAM BLR (SCM)                                         78.21                                  78.13
         KM  (MEASURED)                                        11.88                                  11.92
         FUEL CONSUMPTION L/100KM                              12.06                                  11.27

COMPOSITE RESULTS
   TEST NUMBER              6200T2                                                           3-BAG       (4-BAG)
   BAROMETER      MM HG     744.0                     CARBON DIOXIDE          G/KM          313.6      ( 311.7)
   HUMIDITY       G/KG       10.2                     FUEL CONSUMPTION        L/100KM       11.68      ( 11.61)
   TEMPERATURE    DEG C      26.1                     HYDROCARBONS (THC)      G/KM            .05      (   .05)
                                                      CARBON MONOXIDE         G/KM            .20      (   .19)
                                                      OXIDES OF NITROGEN      G/KM            .80      (   .81)
                                                      PARTICULATES            G/KM           .106      (  .104)
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                                         FTP    VEHICLE EMISSIONS RESULTS
                                                 PROJECT 05-5810-001

TEST NO.   6200T3   RUN   1                  VEHICLE NO.62                              TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88              DATE    9/21/81                            ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                   BAG CART NO. 1 / CVS NO.  3                DIESEL    EM-487-F
TRANSMISSION A3                              DYNO NO.      2                            ODOMETER 10146. KM( 6305. MILES)

BAROMETER 740.92 MM HG(29.17 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  53. PCT                   ABS. HUMIDITY 10.7 GM/KG                   NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                                     1                   2                   3                   4
  DESCRIPTION                              COLD TRANSIENT        STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)            693.4 (27.3)        698.5 (27.5)        698.5 (27.5)        698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)          566.4 (22.3)        571.5 (22.5)        571.5 (22.5)        571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)         36.1 ( 97.0)        35.0 ( 95.0)        36.7 ( 98.0)        36.1 ( 97.0)
  BLOWER REVOLUTIONS                         13866.              23814.              13865.              23805.
  TOT FLOW STD. CU. METRES(SCF)            135.3 ( 4777.)      232.7 ( 8216.)      135.1 ( 4769.)      232.1 ( 8196.)
  HC  SAMPLE METER/RANGE/PPM               18.2/11/  18.        9.0/11/   9.        9.1/11/   9.        8.4/11/   8.
  HC  BCKGRD METER/RANGE/PPM                7.8/ 1/   8.        7.4/ 1/   7.        7.4/ 1/   7.        7.9/ 1/   8.
  CO  SAMPLE METER/RANGE/PPM               34.8/13/  32.       11.8/13/  11.       12.2/13/  11.        8.0/13/   7.
  CO  BCKGRD METER/RANGE/PPM               11.6/13/  10.       10.1/13/   9.        7.2/13/   6.        6.3/13/   6.
  CO2 SAMPLE METER/RANGE/PCT               48.4/ 3/  .84       31.6/ 3/  .52       42.1/ 3/  .72       30.7/ 3/  .51
  CO2 BCKGRD METER/RANGE/PCT                3.6/ 3/  .06        3.4/ 3/  .05        3.5/ 3/  .05        3.3/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM               16.1/ 2/  16.       12.1/ 2/  12.       15.7/ 2/  16.       11.7/ 2/  12.
  NOX BCKGRD METER/RANGE/PPM                 .8/ 2/   1.         .6/ 2/   1.         .6/ 2/   1.         .5/ 2/   1.
  DILUTION FACTOR                             15.93               25.47               18.64               26.29
  HC  CONCENTRATION PPM                       11.                  2.                  2.                  1.
  CO  CONCENTRATION PPM                       21.                  2.                  5.                  2.
  CO2 CONCENTRATION PCT                         .78                 .47                 .67                 .46
  NOX CONCENTRATION PPM                       15.4                11.5                15.1                11.2
  HC  MASS GRAMS                                .85                 .26                 .17                 .10
  CO  MASS GRAMS                               3.38                 .48                 .73                 .45
  CO2 MASS GRAMS                            1943.6              2020.1              1647.4              1952.8
  NOX MASS GRAMS                               3.97                5.13                3.91                4.98
  PARTICULATE MASS GRAMS                        .91                 .60                 .66                 .58

  HC  GRAMS/KM                                  .14                 .04                 .03                 .02
  CO  GRAMS/KM                                  .57                 .08                 .13                 .07
  CO2 GRAMS/KM                               328.6               324.5               285.0               313.2
  NOX GRAMS/KM                                  .67                 .82                 .68                 .80
  FUEL CONSUMPTION BY CB L/100KM              12.27               12.08               10.61               11.66

  RUN TIME              SECONDS              505.                868.                505.                867.
  MEASURED DISTANCE     KM                     5.91                6.23                5.78                6.24
  SCF, DRY                                      .975                .978                .976                .978
      DFC, WET (DRY)                                  .952 ( .936)                           .956 ( .940)
      SCF, WET (DRY)                                 1.000 ( .977)                          1.000 ( .978)
      VOL (SCM)                                             368.0                                  367.2
      SAM BLR (SCM)                                          78.46                                  78.35
      KM  (MEASURED)                                         12.14                                  12.02
      FUEL CONSUMPTION L/100KM                               12.17                                  11.15

COMPOSITE RESULTS                                                                                  3-BAG        (4-BAG)
  TEST NUMBER          6200T3                                  CARBON DIOXIDE        G/KM        314.5        ( 311.2)
  BAROMETER   MM HG   740.9                                    FUEL CONSUMPTION      L/100KM      11.72        ( 11.59)
  HUMIDITY    G/KG     10.7                                    HYDROCARBONS (THC)    G/KM           .06        (   .05)
  TEMPERATURE DEG C    25.0                                    CARBON MONOXIDE       G/KM           .19        (   .19)
                                                               OXIDES OF NITROGEN    G/KM           .75        (   .74)
                                                               PARTICULATES          G/KM          .113        (  .112)
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                                        FTP  - VEHICLE EMISSIONS RESULTS - ZERO KM W/O TRAP
                                               PROJECT 05-5810-001

TEST NO.   6200-1   RUN   1                    VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88                DATE    11/18/81                       ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                     BAG CART NO. 1 / CVS NO.  3            DIESEL     EM-487-F
TRANSMISSION A3                                DYNO NO.      2                        ODOMETER 11492. KM( 7141. MILES)

BAROMETER 737.87 MM HG(29.05 IN HG)            DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  60. PCT                     ABS. HUMIDITY 12.2 GM/KG
BAG RESULTS                                                                           NOX HUMIDITY CORRECTION FACTOR  1.05
  BAG NUMBER                                        1                 2                     3                      4
  DESCRIPTION                                COLD TRANSIENT      STABILIZED          HOT TRANSIENT           STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)       711.2 (28.0)        711.2 (28.0)           711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)            581.7 (22.9)       581.7 (22.9)        581.7 (22.9)           581.7 (22.9)
  BLOWER INLET TEMP. DEG. C(DEG. F)           37.8 (100.0)       37.8 (100.0)        35.6 ( 96.0)           36.7 ( 98.0)
  BLOWER REVOLUTIONS                            13826.             23815.              13823.                 23830.
  TOT FLOW STD. CU. METRES(SCF)              133.6 ( 4716.)     230.0 ( 8122.)      134.0 ( 4731.)         230.6 ( 8143.)
  HC   SAMPLE METER/RANGE/PPM                35.3/11/  35.      19.6/11/  20.       18.1/11/  18.          17.9/11/  18.
  HC   BCKGRD METER/RANGE/PPM                10.9/ 1/  11.       8.6/ 1/   9.        8.6/ 1/   9.           8.1/ 1/   8.
  CO   SAMPLE METER/RANGE/PPM                43.0/13/  40.      24.4/13/  22.       31.1/13/  29.          22.8/13/  21.
  CO   BCKGRD METER/RANGE/PPM                 4.0/13/   4.       3.7/13/   3.        2.5/13/   2.           2.2/13/   2.
  CO2  SAMPLE METER/RANGE/PCT                47.9/ 3/  .83      31.3/ 3/  .52       42.2/ 3/  .72          30.7/ 3/  .51
  CO2  BCKGRD METER/RANGE/PCT                 3.2/ 3/  .05       3.3/ 3/  .05        3.2/ 3/  .05           3.0/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM                17.6/ 2/  18.      13.7/ 2/  14.       17.3/ 2/  17.          13.6/ 2/  14.
  NOX  BCKGRD METER/RANGE/PPM                  .5/ 2/   1.        .4/ 2/   0.         .4/ 2/   0.            .4/ 2/   0.
  DILUTION FACTOR                               16.06              25.62               18.52                  26.17
  HC   CONCENTRATION PPM                         25.                11.                 10.                    10.
  CO   CONCENTRATION PPM                         35.                19.                 26.                    18.
  CO2  CONCENTRATION PCT                         .78                .47                 .67                    .46
  NOX  CONCENTRATION PPM                        17.1               13.3                16.9                   13.2
  FILTER WT. MG (EFFICIENCY, %)              4.814 (98.)        2.712 (97.)         3.394 (98.)            2.676 (97.)
  HC   MASS GRAMS                               1.93               1.51                 .77                   1.34
  CO   MASS GRAMS                               5.51               4.96                3.99                   4.92
  CO2  MASS GRAMS                             1909.5             1980.7              1649.7                 1959.0
  NOX  MASS GRAMS                               4.61               6.17                4.56                   6.14
  PARTICULATE MASS GRAMS                        2.85               1.60                2.02                   1.60

  HC   GRAMS/KM                                  .34                .24                 .13                    .22
  CO   GRAMS/KM                                  .95                .80                 .69                    .79
  CO2  GRAMS/KM                                330.8              319.5               286.7                  315.5
  NOX  GRAMS/KM                                  .80                .99                 .79                    .99
  FUEL CONSUMPTION BY CB L/100KM               12.40              11.96               10.72                  11.81

  RUN TIME                SECONDS               504.               867.                504.                   868.
  MEASURED DISTANCE       KM                    5.77               6.20                5.75                   6.21
  SCF, DRY                                      .973      .975     .976                .974      .975         .976
       DFC, WET (DRY)                                  .952( .934)                            .956( .938)
       TOT VOL (SCM) / SAM BLR (SCM)                 363.6/ 77.33                           364.6/ 77.50
       KM  (MEASURED)                                   11.97                                   11.96
       FUEL CONSUMPTION L/100KM                         12.17                                   11.28

COMPOSITE RESULTS
  TEST NUMBER             6200-1                                                                    3-BAG       (4-BAG)
  BAROMETER     MM HG     737.9                   CARBON DIOXIDE           G/KM                     312.9      ( 311.7)
  HUMIDITY      G/KG       12.2                   FUEL CONSUMPTION         L/100KM                  11.71      ( 11.67)
  TEMPERATURE   DEG C      25.0                   HYDROCARBONS (THC)       G/KM                       .23      (   .22)
                                                  CARBON MONOXIDE          G/KM                       .80      (   .80)
                                                  OXIDES OF NITROGEN       G/KM                       .90      (   .90)
                                                  PARTICULATES             G/KM                      .332      (  .332)
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                                             FTP   - VEHICLE EMISSIONS RESULTS -  ZERO KM W/O TRAP
                                                     PROJECT 05-5810-001
TEST NO.   6200-2   RUN   1
VEHICLE MODEL   80 OLDS DELTA 88                 VEHICLE NO.62
ENGINE 5.7 L(350. CID) V-8                       DATE    11/19/81                         TEST WEIGHT  1928. KG( 4250. LBS)
TRANSMISSION A3                                  BAG CART NO. 1 / CVS NO.  3              ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
                                                 DYNO NO.       2                         DIESEL    EM-487-F
BAROMETER 739.90 MM HG(29.13 IN HG)                                                       ODOMETER 11516. KM( 7156. MILES)
RELATIVE HUMIDITY  50. PCT                       DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
BAG RESULTS                                      ABS. HUMIDITY 10.5 GM/KG
  BAG NUMBER                                                                              NOX HUMIDITY CORRECTION FACTOR   .99
  DESCRIPTION                                        1                  2                    3                     4
                                               COLD TRANSIENT       STABILIZED          HOT TRANSIENT          STABILIZED
  BLOWER DIF P MM. H2O(IN. H2O)                711.2 (28.0)        711.2 (28.0)        711.2 (28.0)          711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)              584.2 (23.0)        584.2 (23.0)        584.2 (23.0)          584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)             35.0 ( 95.0)        35.0 ( 95.0)        36.1 ( 97.0)          35.0 ( 95.0)
  BLOWER REVOLUTIONS                              13849.              23815.              13842.                23806.
  TOT FLOW STD. CU. METRES(SCF)                134.3 ( 4741.)      230.9 ( 8153.)      134.0 ( 4731.)        230.9 ( 8152.)
  HC  SAMPLE METER/RANGE/PPM                   28.9/11/  29.       15.1/11/  15.       13.7/11/  14.         13.4/11/  13.
  HC  BCKGRD METER/RANGE/PPM                    7.0/ 1/   7.        4.7/ 1/   5.        4.7/ 1/   5.          3.6/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                   38.7/13/  36.       20.5/13/  19.       28.0/13/  26.         19.9/13/  18.
  CO  BCKGRD METER/RANGE/PPM                    1.1/13/   1.         .9/13/   1.         .6/13/   1.           .7/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                   47.2/ 3/  .81       30.9/ 3/  .51       42.5/ 3/  .72         29.6/ 3/  .49
  CO2 BCKGRD METER/RANGE/PCT                    2.6/ 3/  .04        2.4/ 3/  .04        2.6/ 3/  .04          2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                   19.2/ 2/  19.       15.6/ 2/  16.       19.7/ 2/  20.         15.0/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                     .4/ 2/   0.         .3/ 2/   0.         .3/ 2/   0.           .4/ 2/   0.
  DILUTION FACTOR                                 16.35               26.02               18.40                 27.26
  HC  CONCENTRATION PPM                           22.                 11.                  9.                   10.
  CO  CONCENTRATION PPM                           34.                 17.                 24.                   17.
  CO2 CONCENTRATION PCT                            .78                 .48                 .69                   .45
  NOX CONCENTRATION PPM                           18.8                15.3                19.4                  14.6
  FILTER WT. MG (EFFICIENCY, %)                4.464 (84.)         2.606 (97.)         3.213 (98.)           2.564 (97.)
  HC  MASS GRAMS                                  1.73                1.41                 .72                  1.32
  CO  MASS GRAMS                                  5.30                4.68                3.81                  4.58
  CO2 MASS GRAMS                                1907.9              2014.3              1684.9                1909.4
  NOX MASS GRAMS                                  4.80                6.71                4.94                  6.40
  PARTICULATE MASS GRAMS                          3.21                1.58                1.91                  1.54

  HC  GRAMS/KM                                     .30                 .23                 .12                   .21
  CO  GRAMS/KM                                     .92                 .76                 .66                   .74
  CO2 GRAMS/KM                                   331.6               326.5               292.1                 309.2
  NOX GRAMS/KM                                     .83                1.09                 .86                  1.04
  FUEL CONSUMPTION BY CB L/100KM                 12.42               12.22               10.92                 11.57

  RUN TIME               SECONDS                 505.                868.                504.                  868.
  MEASURED DISTANCE      KM                      5.75                6.17                5.77                  6.17
  SCF, DRY                                       .976                .979                .977                  .979
       DFC, WET (DRY)                                   .978                                     .979
       TOT VOL (SCM) / SAM BLR (SCM)                .953( .938)                             .957( .941)
       KM  (MEASURED)                              365.2/ 76.47                            364.9/ 76.51
       FUEL CONSUMPTION L/100KM                        11.92                                    11.94
                                                       12.32                                    11.26
COMPOSITE RESULTS
  TEST NUMBER            6200-2
  BAROMETER     MM HG     739.9                              CARBON DIOXIDE         G/KM        3-BAG      (4-BAG)
  HUMIDITY      G/KG       10.5                              FUEL CONSUMPTION       L/100KM     318.1      ( 313.0)
  TEMPERATURE   DEG C      25.6                              HYDROCARBONS (THC)     G/KM        11.90      ( 11.71)
                                                             CARBON MONOXIDE        G/KM          .22      (   .21)
                                                             OXIDES OF NITROGEN     G/KM          .77      (   .76)
                                                             PARTICULATES           G/KM          .97      (   .96)
                                                                                                 .339      (  .338)
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                                          FTP  - VEHICLE EMISSIONS RESULTS -
                                                 PROJECT 05-5810-001

TEST NO.   6200T1   RUN   1                  VEHICLE NO.62                     TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA 88             DATE   11/20/81                   ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                   BAG CART NO. 1 / CVS NO.  3       DIESEL    EM-487-F
TRANSMISSION A3                              DYNO NO.      2                   ODOMETER 11552. KM( 7178. MILES)

BAROMETER 751.59 MM HG(29.59 IN HG)          DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  30. PCT                   ABS. HUMIDITY  6.3 GM/KG          NOX HUMIDITY CORRECTION FACTOR   .87
BAG RESULTS
   BAG NUMBER                                    1                2                 3                 4
   DESCRIPTION                            COLD TRANSIENT     STABILIZED      HOT TRANSIENT      STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           736.6 (29.0)      736.6 (29.0)     736.6 (29.0)      736.6 (29.0)
   BLOWER INLET P MM. H2O(IN. H2O)         604.5 (23.8)      604.5 (23.8)     604.5 (23.8)      604.5 (23.8)
   BLOWER INLET TEMP. DEG. C(DEG. F)        33.9 ( 93.0)      32.2 ( 90.0)     35.0 ( 95.0)      33.9 ( 93.0)
   BLOWER REVOLUTIONS                         13844.            23812.            13858.            23805.
   TOT FLOW STD. CU. METRES(SCF)           136.8 ( 4830.)    236.1 ( 8337.)   136.6 ( 4824.)    235.2 ( 8304.)
   HC  SAMPLE METER/RANGE/PPM              16.2/11/  16.      8.5/11/   9.     9.2/11/   9.      8.0/11/   8.
   HC  BCKGRD METER/RANGE/PPM               8.4/ 1/   8.      5.2/ 1/   5.     5.2/ 1/   5.      4.9/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM              41.3/13/  38.     20.8/13/  19.    31.9/13/  29.     20.6/13/  19.
   CO  BCKGRD METER/RANGE/PPM               3.7/13/   3.      3.0/13/   3.     2.5/13/   2.      2.8/13/   3.
   CO2 SAMPLE METER/RANGE/PCT              43.8/ 3/  .75     28.7/ 3/  .47    40.0/ 3/  .68     28.5/ 3/  .47
   CO2 BCKGRD METER/RANGE/PCT               3.1/ 3/  .05      3.2/ 3/  .05     3.2/ 3/  .05      3.5/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM              15.6/ 2/  16.     12.3/ 2/  12.    16.1/ 2/  16.     11.4/ 2/  11.
   NOX BCKGRD METER/RANGE/PPM                .5/ 2/   1.       .4/ 2/   0.      .3/ 2/   0.       .3/ 2/   0.
   DILUTION FACTOR                            17.77             28.19             19.66             28.41
   HC  CONCENTRATION PPM                        8.                4.                4.                3.
   CO  CONCENTRATION PPM                       34.               16.               27.               16.
   CO2 CONCENTRATION PCT                       .70               .43               .63               .42
   NOX CONCENTRATION PPM                       15.1              11.9              15.8              11.1
   FILTER WT. MG (EFFICIENCY, %)            1.293 (97.)       .896 (95.)      1.215 (98.)        .893 (96.)
   HC  MASS GRAMS                               .66               .48               .34               .45
   CO  MASS GRAMS                              5.48              4.40              4.23              4.38
   CO2 MASS GRAMS                            1763.2            1838.5            1578.8            1796.6
   NOX MASS GRAMS                              3.45              4.69              3.61              4.36
   PARTICULATE MASS GRAMS                       .81               .56               .75               .56

   HC  GRAMS/KM                                 .11               .08               .06               .07
   CO  GRAMS/KM                                 .95               .71               .74               .71
   CO2 GRAMS/KM                               304.4             296.9             274.5             290.7
   NOX GRAMS/KM                                 .60               .76               .63               .71
   FUEL CONSUMPTION BY CB L/100KM             11.39             11.09             10.26             10.86

   RUN TIME               SECONDS             505.              868.              505.              868.
   MEASURED DISTANCE      KM                  5.79              6.19              5.75              6.18
   SCF, DRY                                   .983      .985    .986              .984      .985    .986
        DFC, WET (DRY)                             .957( .947)                         .959( .950)
        TOT VOL (SCM) / SAM BLR (SCM)             372.9/ 78.54                        371.8/ 78.47
        KM  (MEASURED)                              11.99                               11.93
        FUEL CONSUMPTION L/100KM                    11.24                               10.57

COMPOSITE RESULTS                                                                           3-BAG       (4-BAG)
   TEST NUMBER         6200T1                              CARBON DIOXIDE       G/KM       292.3      ( 290.5)
   BAROMETER    MM HG  751.6                               FUEL CONSUMPTION     L/100KM    10.93      ( 10.86)
   HUMIDITY     G/KG     6.3                               HYDROCARBONS (THC)   G/KM         .08      (   .08)
   TEMPERATURE  DEG C   25.6                               CARBON MONOXIDE      G/KM         .77      (   .77)
                                                           OXIDES OF NITROGEN   G/KM         .69      (   .67)
                                                           PARTICULATES         G/KM        .112      (  .112)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -
                                                PROJECT 05-5810-001
TEST NO.   6200T2   RUN   1
VEHICLE MODEL   80 OLDS DELTA88             VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                  DATE    11/23/81                       ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
TRANSMISSION A3                             BAG CART NO. 1 / CVS NO.  3            DIESEL     EM-487-F
                                            DYNO NO.      2                        ODOMETER 11589. KM( 7201. MILES)
BAROMETER 739.65 MM HG(29.12 IN HG)
RELATIVE HUMIDITY  57. PCT                  DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
BAG RESULTS                                 ABS. HUMIDITY 12.0 GM/KG
  BAG NUMBER                                                                       NOX HUMIDITY CORRECTION FACTOR  1.04
  DESCRIPTION                                     1                  2                  3                  4
                                            COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED
  BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)       723.9 (28.5)       711.2 (28.0)       584.2 (23.0)
  BLOWER INLET P MM. H2O(IN. H2O)            584.2 (23.0)       584.2 (23.0)       584.2 (23.0)       711.2 (28.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           36.7 ( 98.0)       36.1 ( 97.0)       36.7 ( 98.0)       36.7 ( 98.0)
  BLOWER REVOLUTIONS                           13871.             23529.             13868.             23793.
  TOT FLOW STD. CU. METRES(SCF)              134.0 ( 4733.)     227.6 ( 8035.)     133.9 ( 4729.)     227.9 ( 8046.)
  HC  SAMPLE METER/RANGE/PPM                 18.8/11/  19.       8.5/11/   9.      12.4/11/  12.      10.1/11/  10.
  HC  BCKGRD METER/RANGE/PPM                  4.2/ 1/   4.       3.8/ 1/   4.       3.8/ 1/   4.       4.2/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                 46.6/13/  44.      21.7/13/  20.      36.4/13/  34.      22.7/13/  21.
  CO  BCKGRD METER/RANGE/PPM                   .9/13/   1.       1.4/13/   1.       1.6/13/   1.       1.5/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                 44.7/ 3/  .77      28.6/ 3/  .47      40.5/ 3/  .69      29.5/ 3/  .49
  CO2 BCKGRD METER/RANGE/PCT                  2.8/ 3/  .04       2.9/ 3/  .04       2.9/ 3/  .04       3.0/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                 12.6/ 2/  13.       9.8/ 2/  10.      13.1/ 2/  13.       9.9/ 2/  10.
  NOX BCKGRD METER/RANGE/PPM                   .4/ 2/   0.        .5/ 2/   1.        .5/ 2/   1.        .4/ 2/   0.
  DILUTION FACTOR                               17.36              28.30              19.38              27.36
  HC  CONCENTRATION PPM                         15.                 5.                 9.                 6.
  CO  CONCENTRATION PPM                         42.                18.                31.                19.
  CO2 CONCENTRATION PCT                          .73                .43                .64                .44
  NOX CONCENTRATION PPM                         12.2                9.3               12.6                9.5
  FILTER WT. MG (EFFICIENCY, %)              1.926 (98.)        1.186 (94.)        1.632 (99.)        1.023 (97.)
  HC  MASS GRAMS                                1.14                .64                .68                .79
  CO  MASS GRAMS                                6.48               4.78               4.88               5.00
  CO2 MASS GRAMS                              1780.6             1783.1             1581.4             1846.1
  NOX MASS GRAMS                                3.27               4.23               3.37               4.32
  PARTICULATE MASS GRAMS                        1.16                .76               1.01                .62

  HC  GRAMS/KM                                   .20                .10                .12                .13
  CO  GRAMS/KM                                  1.12                .77                .85                .81
  CO2 GRAMS/KM                                 307.3              287.2              274.7              297.7
  NOX GRAMS/KM                                   .56                .68                .59                .70
  FUEL CONSUMPTION BY CB L/100KM              ·11.52              10.74              10.28              11.14

  RUN TIME              SECONDS                505.               858.               505.               868.
  MEASURED DISTANCE     KM                     5.79               6.21               5.76               6.20
  SCF, DRY                                     .975               .977               .975               .977
       DFC, WET (DRY)                                    .976                                  .977
       TOT VOL (SCM) / SAM BLR (SCM)                  .956( .939)                           .958( .940)
       KM  (MEASURED)                               361.6/ 76.43                          361.8/ 76.10
       FUEL CONSUMPTION L/100KM                         12.00                                 11.96
                                                        11.12                                 10.72
COMPOSITE RESULTS
  TEST NUMBER              6200T2                                                      3-BAG       (4-BAG)
  BAROMETER     MM HG   739.6               CARBON DIOXIDE           G/KM           287.9       ( 291.0)
  HUMIDITY      G/KG     12.0               FUEL CONSUMPTION         L/100KM        10.78       ( 10.89)
  TEMPERATURE   DEG C    25.6               HYDROCARBONS (THC)       G/KM             .13       (   .13)
                                            CARBON MONOXIDE          G/KM             .86       (   .87)
                                            OXIDES OF NITROGEN       G/KM             .63       (   .64)
                                            PARTICULATES             G/KM            .153       (  .146)
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                                     FTP   - VEHICLE EMISSIONS RESULTS -ZERO MILE DURABILITY
                                             PROJECT 05-5810-001

TEST NO.   6200T3   RUN   1          VEHICLE NO.62                          TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88      DATE   12/ 8/81                        ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8           BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-487-F
TRANSMISSION A3                      DYNO NO.      2                        ODOMETER 11644. KM( 7235. MILES)

BAROMETER 744.98 MM HG(29.33 IN HG)  DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  52. PCT           ABS. HUMIDITY 10.6 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                              1                   2                    3                    4
  DESCRIPTION                      COLD TRANSIENT        STABILIZED         HOT TRANSIENT          STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)     723.9 (28.5)        723.9 (28.5)        723.9 (28.5)        723.9 (28.5)
  BLOWER INLET P MM. H2O(IN. H2O)   589.3 (23.2)        596.9 (23.5)        596.9 (23.5)        589.3 (23.2)
  BLOWER INLET TEMP. DEG. C(DEG. F)  34.4 ( 94.0)        36.1 ( 97.0)        36.1 ( 97.0)        37.2 ( 99.0)
  BLOWER REVOLUTIONS                   13849.              23820.              13862.              23822.
  TOT FLOW STD. CU. METRES(SCF)     135.7 ( 4792.)      232.6 ( 8215.)      135.4 ( 4781.)      232.5 ( 8209.)
  HC  SAMPLE METER/RANGE/PPM        20.4/11/  20.        8.3/11/   8.       11.4/11/  11.        9.4/11/   9.
  HC  BCKGRD METER/RANGE/PPM         4.3/ 1/   4.        4.2/ 1/   4.        4.2/ 1/   4.        4.2/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM        56.0/13/  53.       22.7/13/  21.       42.8/13/  40.       23.1/13/  21.
  CO  BCKGRD METER/RANGE/PPM          .7/13/   1.         .8/13/   1.         .9/13/   1.        1.0/13/   1.
  CO2 SAMPLE METER/RANGE/PCT        50.1/ 3/  .87       32.7/ 3/  .54       45.3/ 3/  .78       32.2/ 3/  .54
  CO2 BCKGRD METER/RANGE/PCT         3.1/ 3/  .05        2.9/ 3/  .04        3.4/ 3/  .05        3.7/ 3/  .06
  NOX SAMPLE METER/RANGE/PPM        13.2/ 2/  13.       10.4/ 2/  10.       13.6/ 2/  14.       10.3/ 2/  10.
  NOX BCKGRD METER/RANGE/PPM          .2/ 2/   0.         .1/ 2/   0.         .4/ 2/   0.         .5/ 2/   1.
  DILUTION FACTOR                       15.29               24.50               17.13               24.91
  HC  CONCENTRATION PPM                  16.                  4.                  7.                  5.
  CO  CONCENTRATION PPM                  51.                 19.                 38.                 20.
  CO2 CONCENTRATION PCT                  .82                 .50                 .73                 .48
  NOX CONCENTRATION PPM                 13.0                10.3                13.2                 9.8
  FILTER WT. MG (EFFICIENCY, %)      4.134 (99.)         1.680 (96.)         2.215 (98.)         1.511 (97.)
  HC  MASS GRAMS                        1.28                 .57                 .58                 .72
  CO  MASS GRAMS                        8.05                5.27                5.98                5.32
  CO2 MASS GRAMS                      2049.1              2136.0              1805.1              2045.5
  NOX MASS GRAMS                        3.37                4.57                3.41                4.35
  PARTICULATE MASS GRAMS                2.54                1.01                1.52                 .92

  HC  GRAMS/KM                           .22                 .09                 .10                 .12
  CO  GRAMS/KM                          1.36                 .83                1.03                 .86
  CO2 GRAMS/KM                         346.4               334.8               309.5               328.7
  NOX GRAMS/KM                           .57                 .72                 .59                 .70
  FUEL CONSUMPTION BY CB L/100KM       12.99               12.51               11.58               12.29

  RUN TIME                SECONDS       505.                868.                505.                868.
  MEASURED DISTANCE       KM            5.92                6.38                5.83                6.22
  SCF, DRY                              .975       .977     .978                .976       .977     .978
       DFC, WET (DRY)                          .950( .934)                             .953( .937)
       TOT VOL (SCM) / SAM BLR (SCM)          368.4/ 78.14                            367.9/ 78.20
       KM  (MEASURED)                             12.30                                   12.06
       FUEL CONSUMPTION L/100KM                   12.74                                   11.95

COMPOSITE RESULTS
  TEST NUMBER           6200T3                                                         3-BAG       (4-BAG)
  BAROMETER    MM HG    745.0                 CARBON DIOXIDE         G/KM             330.3       ( 328.4)
  HUMIDITY     G/KG      10.6                 FUEL CONSUMPTION       L/100KM          12.36       ( 12.29)
  TEMPERATURE  DEG C     25.0                 HYDROCARBONS (THC)     G/KM               .12       (   .13)
                                              CARBON MONOXIDE        G/KM               .99       (  1.00)
                                              OXIDES OF NITROGEN     G/KM               .65       (   .64)
                                              PARTICULATES           G/KM              .242       (  .239)
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                          FTP   - VEHICLE EMISSIONS RESULTS -ZERO MILE DURABILITY
                                  PROJECT 05-5010-001

TEST NO.   6200T4   RUN   1                   VEHICLE NO.62
VEHICLE MODEL   80 OLDS DELTA88                DATE    12/10/81                      TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                     BAG CART NO. 1 / CVS NO.  3          ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
TRANSMISSION A3                                DYNO NO.       2                     DIESEL      EM-487-F
                                                                                    ODOMETER 11774. KM( 7316. MILES)
BAROMETER 742.19 MM HG(29.22 IN HG)            DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  54. PCT                     ABS. HUMIDITY 11.7 GM/KG
BAG RESULTS                                                                         NOX HUMIDITY CORRECTION FACTOR  1.03
   BAG NUMBER                                       1                 2                  3                  4
   DESCRIPTION                                COLD TRANSIENT      STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              723.9 (28.5)       723.9 (28.5)       723.9 (28.5)       723.9 (28.5)
   BLOWER INLET P MM. H2O(IN. H2O)            589.3 (23.2)       589.3 (23.2)       589.3 (23.2)       589.3 (23.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)           33.3 ( 92.0)       35.6 ( 96.0)       35.0 ( 95.0)       36.7 ( 98.0)
   BLOWER REVOLUTIONS                           13829.             23907.             13844.             23780.
   TOT FLOW STD. CU. METRES(SCF)              135.2 ( 4773.)     232.8 ( 8218.)     134.9 ( 4762.)     231.0 ( 8158.)
   HC  SAMPLE METER/RANGE/PPM                 15.8/11/  16.       8.4/11/   8.      10.3/11/  10.       9.8/11/  10.
   HC  BCKGRD METER/RANGE/PPM                  4.3/ 1/   4.       4.4/ 1/   4.       4.4/ 1/   4.       4.2/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                 45.7/13/  43.      24.2/13/  22.      38.2/13/  35.      26.0/13/  24.
   CO  BCKGRD METER/RANGE/PPM                  1.6/13/   1.       1.8/13/   2.       1.9/13/   2.       1.7/13/   2.
   CO2 SAMPLE METER/RANGE/PCT                 47.4/ 3/  .82      30.6/ 3/  .51      43.2/ 3/  .74      31.2/ 3/  .52
   CO2 BCKGRD METER/RANGE/PCT                  2.7/ 3/  .04       2.8/ 3/  .04       3.2/ 3/  .05       2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                 12.8/ 2/  13.      10.0/ 2/  10.      13.5/ 2/  14.      10.0/ 2/  10.
   NOX BCKGRD METER/RANGE/PPM                   .4/ 2/   0.        .3/ 2/   0.        .3/ 2/   0.        .2/ 2/   0.
   DILUTION FACTOR                               16.28              26.31              18.06              25.75
   HC  CONCENTRATION PPM                          12.                 4.                 6.                 6.
   CO  CONCENTRATION PPM                          40.                20.                33.                22.
   CO2 CONCENTRATION PCT                          .78                .47                .69                .47
   NOX CONCENTRATION PPM                          12.4                9.7               13.2                9.8
   FILTER WT. MG (EFFICIENCY, %)              1.382 (97.)         .993 (73.)        1.322 (98.)        1.042 (97.)
   HC  MASS GRAMS                                 .92                .56                .48                .76
   CO  MASS GRAMS                                6.31               5.41               5.14               5.84
   CO2 MASS GRAMS                              1926.7             1982.2             1706.7             2006.8
   NOX MASS GRAMS                                3.32               4.46               3.52               4.47
   PARTICULATE MASS GRAMS                         .82                .81                .77                .63

   HC  GRAMS/KM                                   .16                .09                .08                .12
   CO  GRAMS/KM                                  1.09                .87                .89                .93
   CO2 GRAMS/KM                                 334.0              318.7              293.8              321.0
   NOX GRAMS/KM                                   .57                .72                .61                .72
   FUEL CONSUMPTION BY CB L/100KM               12.51              11.92              10.99              12.01

   RUN TIME               SECONDS                504.               872.               505.               867.
   MEASURED DISTANCE      KM                     5.77               6.22               5.81               6.25
   SCF, DRY                                      .975               .978               .976               .978
      DFC, WET (DRY)                                     .977                                  .977
      TOT VOL (SCM) / SAM BLR (SCM)                .953( .937)                           .955( .939)
      KM  (MEASURED)                              367.9/ 77.68                          365.9/ 77.33
      FUEL CONSUMPTION L/100KM                        11.99                                 12.06
                                                      12.20                                 11.52
COMPOSITE RESULTS
   TEST NUMBER           6200T4                                                         3-BAG       (4-BAG)
   BAROMETER    MM HG    742.2               CARBON DIOXIDE          G/KM               315.0      ( 315.7)
   HUMIDITY     G/KG      11.7               FUEL CONSUMPTION        L/100KM             11.78      ( 11.81)
   TEMPERATURE  DEG C     26.1               HYDROCARBONS (THC)      G/KM                 .10      (   .11)
                                             CARBON MONOXIDE         G/KM                 .92      (   .94)
                                             OXIDES OF NITROGEN      G/KM                 .66      (   .66)
                                             PARTICULATES            G/KM                 .133     (  .124)
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                                          HFTP  - VEHICLE EMISSIONS RESULTS  AFTER T3  50 H20
                                                  PROJECT 05-5810-001
TEST NO.   62HS-1   RUN
VEHICLE MODEL   80 OLDS DELTA88                VEHICLE NO.62                     TEST WEIGHT  1928. KG( 4250. LBS)
ENGINE 5.7 L(350. CID) V-8                     DATE   12/ 9/81                   ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
TRANSMISSION A3                                BAG CART NO. 1 / CVS NO.  3       DIESEL     EM-487-F
                                               DYNO NO.       2                  ODOMETER 11683. KM( 7260. MILES)

BAROMETER 749.55 MM HG(29.51 IN HG)            DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  53. PCT                     ABS. HUMIDITY 11.0 GM/KG          NOX HUMIDITY CORRECTION FACTOR  1.01
BAG RESULTS
   BAG NUMBER
   DESCRIPTION                                                                  HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H20(IN. H20)                                                723.9 (28.5)          723.9 (28.5)
   BLOWER INLET P MM. H20(IN. H20)                                              596.9 (23.5)          596.9 (23.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)                                             34.4 ( 94.0)          32.8 ( 91.0)
   BLOWER REVOLUTIONS                                                              13832.                23014.
   TOT FLOW STD. CU. METRES(SCF)                                                136.0 ( 4803.)        235.0 ( 8297.)
   HC  SAMPLE METER/RANGE/PPM                                                   11.9/11/  12.          9.6/11/  10.
   HC  BCKGRD METER/RANGE/PPM                                                    4.1/ 1/   4.          4.2/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                                                   41.8/13/  39.         24.8/13/  23.
   CO  BCKGRD METER/RANGE/PPM                                                    1.3/13/   1.          1.5/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                                                   42.3/ 3/  .72         31.1/ 3/  .52
   CO2 BCKGRD METER/RANGE/PCT                                                    2.9/ 3/  .04          2.8/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                                                   13.0/ 2/  13.         10.3/ 2/  10.
   NOX BCKGRD METER/RANGE/PPM                                                     .5/ 2/   1.           .6/ 2/   1.
   DILUTION FACTOR                                                                  18.47                 25.85
   HC  CONCENTRATION PPM                                                              8.                    6.
   CO  CONCENTRATION PPM                                                             37.                   21.
   CO2 CONCENTRATION PCT                                                             .68                   .47
   NOX CONCENTRATION PPM                                                            12.5                   9.7
   FILTER WT. MG (EFFICIENCY, %)                                                 3.473 (98.)          1.788 (98.)
   HC  MASS GRAMS                                                                    .63                   .76
   CO  MASS GRAMS                                                                   5.81                  5.69
   CO2 MASS GRAMS                                                                 1690.2                2039.8
   NOX MASS GRAMS                                                                   3.29                  4.41
   PARTICULATE MASS GRAMS                                                           2.12                  1.12

   HC  GRAMS/KM                                                                      .11                   .12
   CO  GRAMS/KM                                                                     1.00                   .91
   CO2 GRAMS/KM                                                                    290.9                 328.2
   NOX GRAMS/KM                                                                      .57                   .71
   FUEL CONSUMPTION BY CB L/100KM                                                  10.89                 12.27

   RUN TIME             SECONDS                                                     504.                  868.
   MEASURED DISTANCE    KM                                                          5.81                  6.22
   SCF, DRY                                                                         .976       .977       .978
        DFC, WET (DRY)                                                                     .956( .939)
        TOT VOL (SCM) / SAM BLR (SCM)                                                    371.0/ 79.02
        KM  (MEASURED)                                                                       12.03
        FUEL CONSUMPTION L/100KM                                                             11.61

COMPOSITE RESULTS
   TEST NUMBER         62HS-1
   BAROMETER    MM HG  749.6                                    CARBON DIOXIDE       G/KM       310.1
   HUMIDITY     G/KG    11.0                                    FUEL CONSUMPTION     L/100KM    11.61
   TEMPERATURE  DEG C   25.6                                    HYDROCARBONS (THC)   G/KM         .12
                                                                CARBON MONOXIDE      G/KM         .96
                                                                OXIDES OF NITROGEN   G/KM         .64
                                                                PARTICULATES         G/KM        .270
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                                        HFTP  - VEHICLE EMISSIONS RESULTS -AFTER REGEN.  45 H20
                                                PROJECT 05-5810-001

TEST NO.    62HS-2   RUN                   VEHICLE NO.62                           TEST WEIGHT  1928. KG( 4250. LBS)
VEHICLE MODEL   80 OLDS DELTA88            DATE   12/ 9/81                         ACTUAL ROAD LOAD    9.1 KW( 12.2 HP)
ENGINE 5.7 L(350. CID) V-8                 BAG CART NO. 1 / CVS NO.  3             DIESEL     EM-487-F
TRANSMISSION A3                            DYNO NO.       2                        ODOMETER 11723. KM( 7284. MILES)

BAROMETER 747.27 MM HG(29.42 IN HG)        DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
RELATIVE HUMIDITY  48. PCT                 ABS. HUMIDITY 10.6 GM/KG                NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER
  DESCRIPTION                                                                      HOT TRANSIENT           STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                                                    723.9 (28.5)            723.9 (28.5)
  BLOWER INLET P MM. H2O(IN. H2O)                                                  596.9 (23.5)            596.9 (23.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)                                                 34.4 ( 94.0)            34.4 ( 94.0)
  BLOWER REVOLUTIONS                                                                 13846.                  23819.
  TOT FLOW STD. CU. METRES(SCF)                                                    135.6 ( 4787.)          233.2 ( 8235.)
  HC  SAMPLE METER/RANGE/PPM                                                        9.4/11/   9.            7.9/11/   8.
  HC  BCKGRD METER/RANGE/PPM                                                        3.8/ 1/   4.            3.8/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                                                       35.5/13/  33.           20.5/13/  19.
  CO  BCKGRD METER/RANGE/PPM                                                         .6/13/   1.             .3/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                                                       42.6/ 3/  .73           31.1/ 3/  .52
  CO2 BCKGRD METER/RANGE/PCT                                                        2.8/ 3/  .04            2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                                                       13.5/ 2/  14.           10.3/ 2/  10.
  NOX BCKGRD METER/RANGE/PPM                                                         .5/ 2/   1.             .4/ 2/   0.
  DILUTION FACTOR                                                                      18.35                   25.87
  HC  CONCENTRATION PPM                                                                 6.                      4.
  CO  CONCENTRATION PPM                                                                31.                     18.
  CO2 CONCENTRATION PCT                                                                 .69                     .48
  NOX CONCENTRATION PPM                                                                13.0                     9.9
  FILTER WT. MG (EFFICIENCY, %)                                                     1.333 (88.)            1.025 (94.)
  HC  MASS GRAMS                                                                        .46                     .58
  CO  MASS GRAMS                                                                       4.95                    4.87
  CO2 MASS GRAMS                                                                     1702.4                  2030.8
  NOX MASS GRAMS                                                                       3.36                    4.40
  PARTICULATE MASS GRAMS                                                                .92                     .69

  HC  GRAMS/KM                                                                          .08                     .09
  CO  GRAMS/KM                                                                          .86                     .79
  CO2 GRAMS/KM                                                                        295.3                   329.8
  NOX GRAMS/KM                                                                          .58                     .72
  FUEL CONSUMPTION BY CB L/100KM                                                      11.04                   12.32

  RUN TIME              SECONDS                                                       505.                    868.
  MEASURED DISTANCE     KM                                                            5.77                    6.16
  SCF, DRY                                                                            .978         .979       .980
      DFC, WET (DRY)                                                                          .956( .941)
      TOT VOL (SCM) / SAM BLR (SCM)                                                          368.8/ 70.42
      KM  (MEASURED)                                                                             11.92
      FUEL CONSUMPTION L/100KM                                                                   11.70

COMPOSITE RESULTS
  TEST NUMBER          62HS-2                                            CARBON DIOXIDE       G/KM       313.3
  BAROMETER    MM HG  747.3                                              FUEL CONSUMPTION     L/100KM    11.71
  HUMIDITY     G/KG    10.6                                              HYDROCARBONS (THC)   G/KM         .09
  TEMPERATURE  DEG C   26.7                                              CARBON MONOXIDE      G/KM         .82
                                                                         OXIDES OF NITROGEN   G/KM         .65
                                                                         PARTICULATES         G/KM        .135
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                                    HFTP - VEHICLE EMISSIONS RESULTS - DISCONNECTED EGR
                                           PROJECT 05-5810-001
 TEST NO.   62HS-3   RUN
 VEHICLE MODEL   80 OLDS DELTA88          VEHICLE NO.62                      TEST WEIGHT  1928. KG( 4250. LBS)
 ENGINE 5.7 L(350. CID) V-8               DATE   12/ 9/81                    ACTUAL ROAD LOAD   9.1 KW( 12.2 HP)
 TRANSMISSION A3                          BAG CART NO. 1 / CVS NO.  3        DIESEL    EM-487-F
                                          DYNO NO.      2                    ODOMETER 11735. KM( 7292. MILES)
 BAROMETER 746.76 MM HG(29.40 IN HG)
 RELATIVE HUMIDITY  44. PCT               DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
 BAG RESULTS                              ABS. HUMIDITY  9.9 GM/KG           NOX HUMIDITY CORRECTION FACTOR   .97
   BAG NUMBER
   DESCRIPTION                                                              HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                                            723.9 (28.5)          723.9 (28.5)
   BLOWER INLET P MM. H2O(IN. H2O)                                          596.9 (23.5)          596.9 (23.5)
   BLOWER INLET TEMP. DEG. C(DEG. F)                                         35.6 ( 96.0)          37.8 (100.0)
   BLOWER REVOLUTIONS                                                          13852.                23819.
   TOT FLOW STD. CU. METRES(SCF)                                            135.1 ( 4772.)        231.7 ( 8180.)
   HC  SAMPLE METER/RANGE/PPM                                                 8.6/11/   9.           7.8/11/   8.
   HC  BCKGRD METER/RANGE/PPM                                                 3.9/ 1/   4.           3.8/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM                                                26.6/13/  24.         18.3/13/  17.
   CO  BCKGRD METER/RANGE/PPM                                                  .6/13/   1.           .7/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                                                41.6/ 3/  .71         30.5/ 3/  .50
   CO2 BCKGRD METER/RANGE/PCT                                                 2.7/ 3/  .04          2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                                                17.8/ 2/  18.         13.6/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM                                                  .4/ 2/   0.           .3/ 2/   0.
   DILUTION FACTOR                                                              18.85                 26.43
   HC  CONCENTRATION PPM                                                         5.                    4.
   CO  CONCENTRATION PPM                                                        23.                   16.
   CO2 CONCENTRATION PCT                                                         .67                   .46
   NOX CONCENTRATION PPM                                                        17.4                  13.3
   FILTER WT. MG (EFFICIENCY. %)                                              .979 (95.)            .792 (95.)
   HC  MASS GRAMS                                                                .38                   .55
   CO  MASS GRAMS                                                               3.65                  4.22
   CO2 MASS GRAMS                                                             1653.9                1959.0
   NOX MASS GRAMS                                                               4.38                  5.74
   PARTICULATE MASS GRAMS                                                        .60                   .51

   HC  GRAMS/KM                                                                  .07                   .09
   CO  GRAMS/KM                                                                  .63                   .68
   CO2 GRAMS/KM                                                                286.6                 314.1
   NOX GRAMS/KM                                                                  .76                   .92
   FUEL CONSUMPTION BY CB L/100KM                                              10.71                 11.73

   RUN TIME               SECONDS                                              505.                  869.
   MEASURED DISTANCE      KM                                                   5.77                  6.24
   SCF, DRY                                                                    .979       .980       .981
        DFC, WET (DRY)                                                               .957( .943)
        TOT VOL (SCM) / SAM BLR (SCM)                                              366.8/ 78.00
        KM  (MEASURED)                                                                 12.01
        FUEL CONSUMPTION L/100KM                                                       11.24
COMPOSITE RESULTS
   TEST NUMBER           62HS-3
   BAROMETER     MM HG   746.8                                CARBON DIOXIDE          G/KM        300.9
   HUMIDITY      G/KG      9.9                                FUEL CONSUMPTION        L/100KM     11.24
   TEMPERATURE   DEG C    26.7                                HYDROCARBONS (THC)      G/KM          .08
                                                              CARBON MONOXIDE         G/KM          .65
                                                              OXIDES OF NITROGEN      G/KM          .84
                                                              PARTICULATES            G/KM         .093
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APPENDIX E

PARTICULATE CONTROL SCREENING EVALUATION WITH THE VOLKSWAGEN

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                                    FTP    VEHICLE EMISSIONS RESULTS
                                            PROJECT 11-5810-001

TEST NO.   6331-1   RUN   1            VEHICLE NO 43
VEHICLE MODEL   80 VW RABBIT           DATE     6/27/80                  TEST WEIGHT  1077. KG( 2375. LBS)
ENGINE 1.5 L( 90. CID) L-4             BAG CART NO.  1                   ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
TRANSMISSION M4                        DYNO NO.      2                   DIESEL     EM-408-F
                                       CVS NO.   3                       ODOMETER   3890. KM( 2417. MILES)

BAROMETER 739.14 MM HG(29.10 IN HG)    DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
RELATIVE HUMIDITY  54. PCT             ABS. HUMIDITY 12.2 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.05
BAG RESULTS
  BAG NUMBER                                 1                  2                  3
  DESCRIPTION                          COLD TRANSIENT      STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)        711.2 (28.0)       708.7 (27.9)      708.7 (27.9)
  BLOWER INLET P MM. H2O(IN. H2O)      417.2 (24.3)       414.7 (24.2)      412.1 (24.1)
  BLOWER INLET TEMP. DEG. C(DEG. F)     37.8 (100.0)       37.8 (100.0)      37.8 (100.0)
  BLOWER REVOLUTIONS                      13864.             23796.            13841.
  TOT FLOW STD. CU. METRES(SCF)        105.0 ( 3709.)     180.4 ( 6368.)    105.1 ( 3711.)
  HC  SAMPLE METER/RANGE/PPM           20.8/11/  21.      12.1/11/  12.     19.5/11/  19.
  HC  BCKGRD METER/RANGE/PPM            3.0/ 1/   3.       2.6/ 1/   3.      2.6/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM           34.4/13/  31.      18.1/13/  16.     31.7/13/  29.
  CO  BCKGRD METER/RANGE/PPM             .5/13/   0.        .3/13/   0.       .3/13/   0.
  CO2 SAMPLE METER/RANGE/PCT           34.7/ 3/  .58      21.1/ 3/  .34     30.5/ 3/  .50
  CO2 BCKGRD METER/RANGE/PCT            3.6/ 3/  .06       3.1/ 3/  .05      3.2/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM           21.0/ 2/  21.      14.8/ 2/  15.     20.4/ 2/  20.
  NOX BCKGRD METER/RANGE/PPM             .7/ 2/   1.        .6/ 2/   1.       .5/ 2/   1.
  DILUTION FACTOR                          22.89              39.05             24.31
  HC  CONCENTRATION PPM                     18.                10.               17.
  CO  CONCENTRATION PPM                     30.                15.               28.
  CO2 CONCENTRATION PCT                     .53                .29               .46
  NOX CONCENTRATION PPM                    20.3               14.2              18.9
  HC  MASS GRAMS                           1.09                .99              1.03
  CO  MASS GRAMS                           3.69               3.23              3.30
  CO2 MASS GRAMS                         1014.5              971.5             880.1
  NOX MASS GRAMS                           4.28               5.15              4.21
  PARTICULATE MASS GRAMS                   1.54               1.10              1.45

  HC  GRAMS/KM                              .19                .16               .18
  CO  GRAMS/KM                              .64                .53               .58
  CO2 GRAMS/KM                            176.2              159.2             152.7
  NOX GRAMS/KM                              .75                .84               .73
  FUEL CONSUMPTION BY CB L/100KM           6.61               5.94              5.74
  RUN TIME                SECONDS          505.               849.              505.
  MEASURED DISTANCE       KM               5.76               6.14              5.74

COMPOSITE RESULTS
  TEST NUMBER              6331-1
  BAROMETER      MM HG     739.1                  CARBON DIOXIDE         G/KM         3-BAG      (4-BAG)
  HUMIDITY       G/KG       12.2                  FUEL CONSUMPTION       L/100KM      140.5     (   0.0)
  TEMPERATURE    DEG C      26.7                  HYDROCARBONS (THC)     G/KM          6.02     (  0.00)
                                                  CARBON MONOXIDE        G/KM           .17     (  0.00)
                                                  OXIDES OF NITROGEN     G/KM           .57     (  0.00)
                                                  PARTICULATES           G/KM           .79     (  0.00)
                                                                                        .218    ( 0.000)
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                                        FTP    VEHICLE EMISSIONS RESULTS
                                                 PROJECT 11-5810-001

TEST NO.   6331-2   RUN   1                      VEHICLE NO.63                               TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT                     DATE     7/ 1/80                            ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4                       BAG CART NO.  1                             DIESEL    EM-408-F
TRANSMISSION M4                                  DYNO NO.      2                             ODOMETER  7168. KM( 4454. MILES)
                                                 CVS NO.    3

BAROMETER 740.66 MM HG(29.16 IN HG)              DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  59. PCT                       ABS. HUMIDITY 11.6 GM/KG                    NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
  BAG NUMBER                                          1                  2                   3
  DESCRIPTION                                    COLD TRANSIENT      STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                   498.5 (27.5)       498.5 (27.5)       498.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)                 559.8 (22.0)       559.8 (22.0)       559.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)                36.1 ( 97.0)       36.7 ( 98.0)       37.2 ( 99.0)
  BLOWER REVOLUTIONS                                 13871.             23901.             13890.
  TOT FLOW STD. CU. METRES(SCF)                   106.3 ( 3754.)     182.2 ( 6435.)     106.3 ( 3752.)
  HC  SAMPLE METER/RANGE/PPM                      18.9/11/  19.      11.4/11/  11.      19.5/11/  19.
  HC  BCKGRD METER/RANGE/PPM                       3.3/ 1/   3.       2.5/ 1/   3.       2.5/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM                      32.2/13/  29.      17.6/13/  16.      31.2/13/  28.
  CO  BCKGRD METER/RANGE/PPM                       1.2/13/   1.        .5/13/   0.       1.0/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                      34.0/ 3/  .57      21.4/ 3/  .35      29.9/ 3/  .49
  CO2 BCKGRD METER/RANGE/PCT                       3.5/ 3/  .05       3.2/ 3/  .05       3.5/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                      21.4/ 2/  21.      15.2/ 2/  15.      21.0/ 2/  21.
  NOX BCKGRD METER/RANGE/PPM                        .6/ 2/   1.        .7/ 2/   1.        .7/ 2/   1.
  DILUTION FACTOR                                     23.42              38.49              24.88
  HC  CONCENTRATION PPM                                14.                 9.                17.
  CO  CONCENTRATION PPM                                27.                15.                27.
  CO2 CONCENTRATION PCT                                .52                .30                .44
  NOX CONCENTRATION PPM                               20.8               14.5               20.3
  HC  MASS GRAMS                                       .84                .94               1.05
  CO  MASS GRAMS                                      3.39               3.13               3.30
  CO2 MASS GRAMS                                    1004.8              993.5              860.3
  NOX MASS GRAMS                                      4.36               5.22               4.24
  PARTICULATE MASS GRAMS                              1.72               1.16               1.56

  HC  GRAMS/KM                                         .17                .15                .18
  CO  GRAMS/KM                                         .59                .51                .58
  CO2 GRAMS/KM                                       175.3              160.9              150.6
  NOX GRAMS/KM                                         .76                .84                .75
  FUEL CONSUMPTION BY CB L/100KM                      6.57               6.03               5.66
  RUN TIME            SECONDS                         505.               868.               504.
  MEASURED DISTANCE   KM                              5.73               6.17               5.71

COMPOSITE RESULTS
  TEST NUMBER             6331-2                                                                          3-BAG       (4-BAG)
  BAROMETER     MM HG     740.7                           CARBON DIOXIDE         G/KM       161.1      (   0.0)
  HUMIDITY      G/KG       11.6                           FUEL CONSUMPTION       L/100KM     6.04      (  0.00)
  TEMPERATURE   DEG C      24.4                           HYDROCARBONS (THC)     G/KM         .16      (  0.00)
                                                          CARBON MONOXIDE        G/KM         .54      (  0.00)
                                                          OXIDES OF NITROGEN     G/KM         .80      (  0.00)
                                                          PARTICULATES           G/KM        .235      ( 0.000)
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                              FTP    VEHICLE EMISSIONS RESULTS
                                      PROJECT 11-5810-001

TEST NO.   633102   RUN   2             VEHICLE NO 43                        TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT            DATE     6/30/80                     ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4              BAG CART NO.  1                      DIESEL     EM-408-F
TRANSMISSION M4                         DYNO NO.      2                      ODOMETER  7221. KM( 4487. MILES)
                                        CVS NO.    3

BAROMETER 740.66 MM HG(29.16 IN HG)     DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  50. PCT              ABS. HUMIDITY 10.9 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.01
BAG RESULTS
  BAG NUMBER                                  1                2                  3
  DESCRIPTION                          COLD TRANSIENT      STABILIZED       HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)         708.7 (27.9)      711.2 (28.0)      708.7 (27.9)
  BLOWER INLET P MM. H2O(IN. H2O)       414.7 (24.2)      417.2 (24.3)      414.7 (24.2)
  BLOWER INLET TEMP. DEG. C(DEG. F)      36.7 ( 98.0)      36.4 ( 97.5)      37.8 (100.0)
  BLOWER REVOLUTIONS                       13845.            23909.            13840.
  TOT FLOW STD. CU. METRES(SCF)         105.4 ( 3720.)    181.2 ( 6398.)    105.3 ( 3717.)
  HC  SAMPLE METER/RANGE/PPM            19.2/11/  19.     13.1/11/  13.     19.4/11/  19.
  HC  BCKGRD METER/RANGE/PPM             4.0/ 1/   4.      3.0/ 1/   3.      3.0/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM            32.5/13/  30.     17.9/13/  16.     29.9/13/  27.
  CO  BCKGRD METER/RANGE/PPM              .3/13/   0.       .1/13/   0.       .1/13/   0.
  CO2 SAMPLE METER/RANGE/PCT            33.2/ 3/  .55     19.8/ 3/  .32     29.0/ 3/  .48
  CO2 BCKGRD METER/RANGE/PCT             3.3/ 3/  .05      2.5/ 3/  .04      2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM            19.9/ 2/  20.     12.9/ 2/  13.     19.3/ 2/  19.
  NOX BCKGRD METER/RANGE/PPM              .8/ 2/   1.       .6/ 2/   1.       .9/ 2/   1.
  DILUTION FACTOR                          24.02             41.73             27.77
  HC  CONCENTRATION PPM                     15.               10.               17.
  CO  CONCENTRATION PPM                     29.               15.               24.
  CO2 CONCENTRATION PCT                      .50               .28               .44
  NOX CONCENTRATION PPM                    19.1              12.3              18.4
  HC  MASS GRAMS                              .97              1.07              1.00
  CO  MASS GRAMS                             3.50              3.25              3.22
  CO2 MASS GRAMS                           973.4             932.1             841.5
  NOX MASS GRAMS                             3.88              4.28              3.77
  PARTICULATE MASS GRAMS                     1.51              1.18              1.40

  HC   GRAMS/KM                               .16               .17               .17
  CO   GRAMS/KM                               .60               .52               .56
  CO2  GRAMS/KM                            147.4             148.9             145.4
  NOX  GRAMS/KM                               .67               .60               .65
  FUEL CONSUMPTION BY CB L/100KM             4.28              5.59              5.47
  RUN TIME            SECONDS              505.              868.              505.
  MEASURED DISTANCE     KM                   5.81              4.24              5.78

COMPOSITE RESULTS
  TEST NUMBER            633102
  BAROMETER     MM HG    740.7                                                  3-BAG      (4-BAG)
  HUMIDITY      G/KG      10.9           CARBON DIOXIDE        G/KM              151.8      (   0.0)
  TEMPERATURE   DEG C     26.1           FUEL CONSUMPTION      L/100KM             5.70     (  0.00)
                                         HYDROCARBONS (THC)    G/KM                 .17     (  0.00)
                                         CARBON MONOXIDE       G/KM                 .55     (  0.00)
                                         OXIDES OF NITROGEN    G/KM                 .67     (  0.00)
                                         PARTICULATES          G/KM                 .218    ( 0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS
                                            PROJECT 11-5810-001

TEST NO.   433103   RUN   1            VEHICLE NO.43                      TEST WEIGHT  1077. KG( 2375. LBS)
VEHICLE MODEL   80 VW RABBIT           DATE     7/ 3/80                   ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
ENGINE 1.5 L( 90. CID) L-4             BAG CART NO.   1                   DIESEL    EM-408-F
TRANSMISSION M4                        DYNO NO.       2                   ODOMETER  7202. KM( 4475. MILES)
                                       CVS NO.    3

BAROMETER 738.43 MM HG(29.08 IN HG)    DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)
RELATIVE HUMIDITY  51. PCT             ABS. HUMIDITY 12.0 GM/KG                NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
   BAG NUMBER                                 1                   2                  3
   DESCRIPTION                         COLD TRANSIENT        STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)        711.2 (28.0)        711.2 (28.0)       711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)      561.3 (22.1)        563.8 (22.2)       563.8 (22.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)     37.8 (100.0)        37.8 (100.0)       39.4 (103.0)
   BLOWER REVOLUTIONS                      13833.              23727.             13859.
   TOT FLOW STD. CU. METRES(SCF)        105.4 ( 3720.)      180.6 ( 6378.)     105.0 ( 3707.)
   HC  SAMPLE METER/RANGE/PPM           17.4/11/  17.       10.9/11/  11.      19.2/11/  18.
   HC  BCKGRD METER/RANGE/PPM            2.4/ 1/   2.        2.0/ 1/   2.       2.0/ 1/   2.
   CO  SAMPLE METER/RANGE/PPM           33.2/13/  30.       19.0/13/  17.      31.1/13/  28.
   CO  BCKGRD METER/RANGE/PPM             .7/13/   1.         .9/13/   1.        .7/13/   1.
   CO2 SAMPLE METER/RANGE/PCT           33.4/ 3/  .54       20.1/ 3/  .32      29.4/ 3/  .48
   CO2 BCKGRD METER/RANGE/PCT            3.0/ 3/  .05        3.1/ 3/  .05       3.2/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM           19.3/ 2/  19.       13.1/ 2/  13.      19.4/ 2/  19.
   NOX BCKGRD METER/RANGE/PPM             .2/ 2/   0.         .2/ 2/   0.        .2/ 2/   0.
   DILUTION FACTOR                          24.50               41.10              27.37
   HC  CONCENTRATION PPM                     15.                  9.                17.
   CO  CONCENTRATION PPM                     29.                 14.                27.
   CO2 CONCENTRATION PCT                     .50                 .28                .44
   NOX CONCENTRATION PPM                    19.1                11.8               18.2
   HC  MASS GRAMS                            .83                 .93               1.05
   CO  MASS GRAMS                           3.54                3.32               3.29
   CO2 MASS GRAMS                          941.0               914.3              941.5
   NOX MASS GRAMS                           3.80                4.29               3.81
   PARTICULATE MASS GRAMS                   1.45                1.10               1.40

   HC  GRAMS/KM                              .14                 .15                .18
   CO  GRAMS/KM                              .64                 .55                .58
   CO2 GRAMS/KM                            171.9               150.4              147.5
   NOX GRAMS/KM                              .68                 .70                .67
   FUEL CONSUMPTION BY CB L/100KM           6.45                5.65               5.54
   RUN TIME               SECONDS           504.                868.               505.
   MEASURED DISTANCE      KM                5.50                6.08               5.71

COMPOSITE RESULTS
   TEST NUMBER              433103
   BAROMETER       MM HG     738.4                   CARBON DIOXIDE          G/KM         3-BAG        (4-BAG)
   HUMIDITY        G/KG       12.0                   FUEL CONSUMPTION        L/100KM      154.1        (   0.0)
   TEMPERATURE     DEG C      27.2                   HYDROCARBONS (THC)      G/KM          5.78        (  0.00)
                                                     CARBON MONOXIDE         G/KM           .14        (  0.00)
                                                     OXIDES OF NITROGEN      G/KM           .57        (  0.00)
                                                     PARTICULATES            G/KM           .69        (  0.00)
                                                                                           .215        ( 0.000)
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                                        H 505  VEHICLE EMISSIONS RESULTS - DIESEL FUEL ONLY
                                                 PROJECT 11-5810-001

TEST NO.   6363-1   RUN   1              VEHICLE NO.63
VEHICLE MODEL   80 VW RABBIT             DATE     5/ 5/81                    TEST WEIGHT  1077. KG( 2375. LBS)
ENGINE 1.5 L( 90. CID) L-4               BAG CART NO.  1                     ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
TRANSMISSION M4                          DYNO NO.      2                     DIESEL     EM-465-F
                                         CVS NO.   3                         ODOMETER  8446. KM( 5248. MILES)

BAROMETER 737.87 MM HG(29.05 IN HG)      DRY BULB TEMP. 27.8 DEG C(82.0 DEG F)
RELATIVE HUMIDITY  28. PCT               ADS. HUMIDITY  6.8 GM/KG            NOX HUMIDITY CORRECTION FACTOR   .89
0 BAG RESULTS
   TEST CYCLE                              H-505

   BLOWER DIF P MM. H2O(IN. H2O)          708.7 (27.9)
   BLOWER INLET P MM. H2O(IN. H2O)        561.3 (22.1)
   BLOWER INLET TEMP. DEG. C(DEG. F)       33.9 ( 93.0)
   BLOWER REVOLUTIONS                        13059.
   TOT FLOW STD. CU. METRES(SCF)          106.2 ( 3752.)
   HC  SAMPLE METER/RANGE/PPM             27.6/11/  28.
   HC  BCKGRD METER/RANGE/PPM              7.4/ 1/   7.
   CO  SAMPLE METER/RANGE/PPM             31.7/13/  29.
   CO  BCKGRD METER/RANGE/PPM               .7/13/   1.
   CO2 SAMPLE METER/RANGE/PCT             31.0/ 3/  .51
   CO2 BCKGRD METER/RANGE/PCT              3.3/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM             27.0/ 2/  27.
   NOX BCKGRD METER/RANGE/PPM              1.0/ 2/   1.
   DILUTION FACTOR                            25.81
   HC  CONCENTRATION PPM                       20.
   CO  CONCENTRATION PPM                       28.
   CO2 CONCENTRATION PCT                       .46
   NOX CONCENTRATION PPM                      26.0
   HC  MASS GRAMS                              1.25
   CO  MASS GRAMS                              3.47
   CO2 MASS GRAMS                            904.4
   NOX MASS GRAMS                              4.69
   PARTICULATE MASS GRAMS                       .87
   RUN TIME                 SECONDS           505.
        DFC, WET (DRY)                    .961 ( .952)
        SCF, WET (DRY)                   1.000 ( .986)
        VOL (SCM)                            106.2
        SAM BLR (SCM)                         0.00
        KM  (MEASURED)                        5.79

  TEST NUMBER,                               6363-1
  BAROMETER,              MM HG              737.9
  HUMIDITY,               G/KG                 6.8
  TEMPERATURE,            DEG C               27.8
   CARBON DIOXIDE,         G/KM              156.3
  FUEL CONSUMPTION,       L/100KM             5.87

  HYDROCARBONS,           G/KM                 .22
  CARBON MONOXIDE,        G/KM                 .60
  OXIDES OF NITROGEN,     G/KM                 .81
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                                             H-867  VEHICLE EMISSIONS RESULTS  - DIESEL FUEL ONLY
                                                        PROJECT 11-5810-001

 TEST NO.    6363-1   RUN   1                     VEHICLE NO.63                         TEST WEIGHT  1077. KG( 2375. LBS)
 VEHICLE MODEL   80 VW RABBIT                     DATE     5/ 5/81                      ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
 ENGINE 1.5 L( 90. CID) L 4                       BAG CART NO.  1                       DIESEL     EM-465-F
 TRANSMISSION M4                                  DYNO NO.      2                       ODOMETER  8446. KM( 5248. MILES)
                                                  CVS NO.   3

 BAROMETER 737.07 MM HG(29.05 IN HG)              DRY BULB TEMP. 27.8 DEG C(82.0 DEG F)
 RELATIVE HUMIDITY  28. PCT                       ABS. HUMIDITY  6.8 GM/KG              NOX HUMIDITY CORRECTION FACTOR   .89
0 BAG RESULTS
   TEST CYCLE                                       H-867

   BLOWER DIF P MM. H2O(IN. H2O)                 708.7 (27.9)
   BLOWER INLET P MM. H2O(IN. H2O)               561.3 (22.1)
   BLOWER INLET TEMP. DEG. C(DEG. F)              35.0 ( 95.0)
   BLOWER REVOLUTIONS                               23855.
   TOT FLOW STD. CU. METRES(SCF)                 182.4 ( 6441.)
   HC  SAMPLE METER/RANGE/PPM                    21.0/11/  21.
   HC  BCKGRD METER/RANGE/PPM                     7.4/ 1/   7.
   CO  SAMPLE METER/RANGE/PPM                    21.9/13/  20.
   CO  BCKGRD METER/RANGE/PPM                      .5/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                    22.3/ 3/  .36
   CO2 BCKGRD METER/RANGE/PCT                     3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                    10.6/ 2/  19.
   NOX BCKGRD METER/RANGE/PPM                     1.6/ 2/   2.
   DILUTION FACTOR                                   36.71
   HC  CONCENTRATION PPM                               14.
   CO  CONCENTRATION PPM                               19.
   CO2 CONCENTRATION PCT                               .31
   NOX CONCENTRATION PPM                              17.0
   HC  MASS GRAMS                                      1.45
   CO  MASS GRAMS                                      4.08
   CO2 MASS GRAMS                                    1051.2
   NOX MASS GRAMS                                      5.27
   PARTICULATE MASS GRAMS                               .88
   RUN TIME              SECONDS                      869.
        DFC, WET (DRY)                             .973 ( .964)
        SCF, WET (DRY)                            1.000 ( .987)
        VOL (SCM)                                     182.4
        SAM BLR (SCM)                                  0.00
        KM  (MEASURED)                                 6.23

   TEST NUMBER,                                    6363-1
   BAROMETER,              MM HG                    737.9
   HUMIDITY,               G/KG                       6.8
   TEMPERATURE,            DEG C                     27.8
    CARBON DIOXIDE,         G/KM                    168.6
   FUEL CONSUMPTION,       L/100KM                   6.34

   HYDROCARBONS,           G/KM                       .23
   CARBON MONOXIDE,        G/KM                       .65
   OXIDES OF NITROGEN,     G/KM                       .85
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                                           H-505  VEHICLE EMISSIONS RESULTS - DIESEL PLUS METHANOL
TEST NO.   6363C1   RUN   1                        PROJECT 11-5810-001
VEHICLE MODEL   80 VW RABBIT
ENGINE 1.5 L( 90. CID) L-4                   VEHICLE NO.63
TRANSMISSION M4                              DATE    5/ 5/81            TEST WEIGHT  1077. KG( 2375. LBS)
                                             BAG CART NO.  1            ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
BAROMETER 738.63 MM HG(29.08 IN HG)          DYNO NO.      2            METHANOL  EM-464-F
RELATIVE HUMIDITY  45. PCT                   CVS NO.   3                ODOMETER  8393. KM( 5215. MILES)
0 BAG RESULTS
    TEST CYCLE                               DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
                                             ABS. HUMIDITY 10.0 GM/KG
                                                                        NOX HUMIDITY CORRECTION FACTOR   .98
    BLOWER DIF P MM. H2O(IN. H2O)              H-505
    BLOWER INLET P MM. H2O(IN. H2O)          708.7 (27.9)
    BLOWER INLET TEMP. DEG. C(DEG. F)        563.9 (22.2)
    BLOWER REVOLUTIONS                        36.1 ( 97.0)
    TOT FLOW STD. CU. METRES(SCF)               13874.
    HC  SAMPLE METER/RANGE/PPM               105.9 ( 3741.)
    HC  BCKGRD METER/RANGE/PPM               21.0/13/  84.
    CO  SAMPLE METER/RANGE/PPM                8.0/ 1/   8.
    CO  BCKGRD METER/RANGE/PPM               51.7/12/ 110.
    CO2 SAMPLE METER/RANGE/PCT                 .2/12/   0.
    CO2 BCKGRD METER/RANGE/PCT               32.1/ 3/  .53
    NOX SAMPLE METER/RANGE/PPM                2.5/ 3/  .04
    NOX BCKGRD METER/RANGE/PPM                9.1/ 2/   9.
    DILUTION FACTOR                            .3/ 2/   0.
    HC  CONCENTRATION PPM                        24.26
    CO  CONCENTRATION PPM                         76.
    CO2 CONCENTRATION PCT                        107.
    NOX CONCENTRATION PPM                          .50
    HC  MASS GRAMS                                8.8
    CO  MASS GRAMS                                4.66
    CO2 MASS GRAMS                               13.20
    NOX MASS GRAMS                              963.2
    PARTICULATE MASS GRAMS                        1.75
    RUN TIME                 SECONDS               .57
         DFC, WET (DRY)                         505.
         SCF, WET (DRY)                       .959 ( .945)
         VOL (SCM)                           1.000 ( .981)
         SAM BLR (SCM)                          105.9
         KM  (MEASURED)                           0.00
  TEST NUMBER,                                    5.73
  BAROMETER,              MM HG              6363C1
  HUMIDITY,               G/KG                738.6
  TEMPERATURE,            DEG C                10.0
   CARBON DIOXIDE,         G/KM                26.7
  FUEL CONSUMPTION,       L/100KM             168.0
                                               13.56
  HYDROCARBONS,           G/KM
  CARBON MONOXIDE,        G/KM                   .81
  OXIDES OF NITROGEN,     G/KM                  2.30
                                                  .30
                                             H-867  VEHICLE EMISSIONS RESULTS - DIESEL PLUS METHANOL
                                                     PROJECT 11-5810-001
TEST NO.   6363C1   RUN   1                    VEHICLE NO.63
VEHICLE MODEL   80 VW RABBIT                   DATE     5/ 5/81                TEST WEIGHT  1077. KG( 2375. LBS)
ENGINE 1.5 L( 90. CID) L-4                     BAG CART NO.  1                 ACTUAL ROAD LOAD   5.1 KW(  6.8 HP)
TRANSMISSION M4                                DYNO NO.      2                 METHANOL  CM 464 F
                                               CVS NO.   3                     ODOMETER  8399. KM( 5219. MILES)

BAROMETER 738.38 MM HG(29.07 IN HG)            DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
RELATIVE HUMIDITY  45. PCT                     ABS. HUMIDITY 10.0 GM/KG
0 BAG RESULTS                                                                  NOX HUMIDITY CORRECTION FACTOR   .98
   TEST CYCLE                                    H-867

   BLOWER DIF P MM. H2O(IN. H2O)               698.5 (27.5)
   BLOWER INLET P MM. H2O(IN. H2O)             558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)            36.1 ( 97.0)
   BLOWER REVOLUTIONS                             23843.
   TOT FLOW STD. CU. METRES(SCF)               182.1 ( 6431.)
   HC   SAMPLE METER/RANGE/PPM                 16.2/13/  65.
   HC   BCKGRD METER/RANGE/PPM                  8.0/ 1/   8.
   CO   SAMPLE METER/RANGE/PPM                 63.8/13/  61.
   CO   BCKGRD METER/RANGE/PPM                   .7/13/   1.
   CO2  SAMPLE METER/RANGE/PCT                 22.5/ 3/  .36
   CO2  BCKGRD METER/RANGE/PCT                  2.3/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM                  8.2/ 2/   8.
   NOX  BCKGRD METER/RANGE/PPM                   .5/ 2/   1.
   DILUTION FACTOR                                35.56
   HC   CONCENTRATION PPM                          57.
   CO   CONCENTRATION PPM                          60.
   CO2  CONCENTRATION PCT                          .33
   NOX  CONCENTRATION PPM                          7.7
   HC   MASS GRAMS                                 5.78
   CO   MASS GRAMS                                12.63
   CO2  MASS GRAMS                              1101.1
   NOX  MASS GRAMS                                 2.63
   PARTICULATE MASS GRAMS                           .48
   RUN TIME             SECONDS                   868.
        DFC, WET (DRY)                         .972 ( .958)
        SCF, WET (DRY)                        1.000 ( .982)
        VOL (SCM)                                 182.1
        SAM BLR (SCM)                              0.00
        KM  (MEASURED)                             6.21

   TEST NUMBER,                                  6363C1
   BAROMETER,              MM HG                  738.4
   HUMIDITY,               G/KG                    10.0
   TEMPERATURE,            DEG C                   26.7
    CARBON DIOXIDE,         G/KM                  177.4
   FUEL CONSUMPTION,       L/100KM                14.07

   HYDROCARBONS,           G/KM                     .96
   CARBON MONOXIDE,        G/KM                    2.03
   OXIDES OF NITROGEN,     G/KM                     .42
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APPENDIX F

WATER INJECTION EVALUATIONS WITH A 1981 MERCEDES

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                                        FTP    VEHICLE EMISSIONS RESULTS - W/O WATER INJECTION
                                                 PROJECT 11-5810-001
TEST NO.   6441-2   RUN   1
VEHICLE MODEL   81 MERCEDES  300SD          VEHICLE NO.64
ENGINE 3.0 L(183. CID) L-5                  DATE    2/20/81                       TEST WEIGHT  1814. KG( 4000. LBS)
TRANSMISSION M3                             BAG CART NO.  1                       ACTUAL ROAD LOAD   8.6 KW( 11.5 HP)
                                            DYNO NO.      2                       DIESEL     EM-465-F
                                            CVS NO.    3                          ODOMETER  3075. KM( 1911. MILES)
BAROMETER 739.65 MM HG(29.12 IN HG)
RELATIVE HUMIDITY  44. PCT                  DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
BAG RESULTS                                 ABS. HUMIDITY  9.5 GM/KG
   BAG NUMBER                                                                      NOX HUMIDITY CORRECTION FACTOR   .96
   DESCRIPTION                                    1                  2                  3
                                           COLD TRANSIENT        STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           711.2 (28.0)        716.3 (28.2)        711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)         581.7 (22.9)        584.2 (23.0)        581.7 (22.9)
   BLOWER INLET TEMP. DEG. C(DEG. F)        36.1 ( 97.0)        30.6 ( 87.0)        34.4 ( 94.0)
   BLOWER REVOLUTIONS                        13869.              23790.              13872.
   TOT FLOW STD. CU. METRES(SCF)           134.6 ( 4752.)      233.4 ( 8243.)      135.0 ( 4766.)
   HC   SAMPLE METER/RANGE/PPM             20.6/11/  21.       14.8/11/  15.       15.8/11/  16.
   HC   BCKGRD METER/RANGE/PPM              4.8/ 1/   5.        4.0/ 1/   4.        4.0/ 1/   4.
   CO   SAMPLE METER/RANGE/PPM             31.2/13/  29.       16.1/13/  15.       22.9/13/  21.
   CO   BCKGRD METER/RANGE/PPM               .1/13/   0.         .1/13/   0.         .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT              43.7/ 3/  .75       24.9/ 3/  .41       37.5/ 3/  .63
   CO2 BCKGRD METER/RANGE/PCT               3.0/ 3/  .05        3.1/ 3/  .05        3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM              15.1/ 2/  15.       10.4/ 2/  10.       15.2/ 2/  15.
   NOX BCKGRD METER/RANGE/PPM                .6/ 2/   1.         .8/ 2/   1.         .7/ 2/   1.
   DILUTION FACTOR                            17.82               32.78               21.10
   HC   CONCENTRATION PPM                      16.                 11.                 12.
   CO   CONCENTRATION PPM                      28.                 14.                 20.
   CO2 CONCENTRATION PCT                       .70                 .36                 .59
   NOX CONCENTRATION PPM                      14.5                 9.6                14.5
   HC   MASS GRAMS                             1.25                1.47                 .93
   CO   MASS GRAMS                             4.36                3.86                3.18
   CO2 MASS GRAMS                           1733.7              1538.0              1448.0
   NOX MASS GRAMS                              3.60                4.14                3.61
   PARTICULATE MASS GRAMS                      1.54                1.37                1.16

   HC   GRAMS/KM                                .22                 .24                 .16
   CO   GRAMS/KM                                .75                 .63                 .55
   CO2 GRAMS/KM                               299.7               249.9               250.5
   NOX GRAMS/KM                                 .62                 .67                 .62
   FUEL CONSUMPTION BY CB L/100KM             11.22                9.36                9.37
   RUN TIME              SECONDS               505.                867.                505.
   MEASURED DISTANCE     KM                    5.79                6.15                5.78
   DFC, DRY                                    .979                .982                .980

COMPOSITE RESULTS
   TEST NUMBER             6441-2                                                          3-BAG       (4-BAG)
   BAROMETER      MM HG    739.6                   CARBON DIOXIDE          G/KM            260.4     (   0.0)
   HUMIDITY       G/KG       9.5                   FUEL CONSUMPTION        L/100KM          9.75     (   0.00)
   TEMPERATURE    DEG C     26.1                   HYDROCARBONS (THC)      G/KM              .21     (   0.00)
                                                   CARBON MONOXIDE         G/KM              .63     (   0.00)
                                                   OXIDES OF NITROGEN      G/KM              .65     (   0.00)
                                                   PARTICULATES            G/KM             .226     (  0.000)
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                                   FTP    VEHICLE EMISSIONS RESULTS - W/O WATER INJECTION
                                           PROJECT 11-5810-001

TEST NO.    6441-3   RUN   1                 VEHICLE NO.64                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   81 MERCEDES  300SD           DATE     2/25/81                       ACTUAL ROAD LOAD   8.6 KW( 11.5 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO.  1                        DIESEL    EM-465-F
TRANSMISSION A3                              DYNO NO.      2                        ODOMETER  3112. KM( 1934. MILES)
                                             CVS NO.   3

BARCMETER 740.16 MM HG(29.14 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  49. PCT                   ABS. HUMIDITY 10.0 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .98
BAG RESULTS
  BAG NUMBER                                       1                   2                   3
  DESCRIPTION                               COLD TRANSIENT        STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)        713.7 (28.1)        711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)            581.7 (22.9)        584.2 (23.0)        584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           35.0 ( 95.0)        30.6 ( 87.0)        35.6 ( 96.0)
  BLOWER REVOLUTIONS                            13865.              23812.              13871.
  TOT FLOW STD. CU. METRES(SCF)              134.0 ( 4730.)      232.2 ( 8201.)      133.8 ( 4726.)
  HC   SAMPLE METER/RANGE/PPM                24.5/11/  24.       18.2/11/  18.       20.2/11/  20.
  HC   BCKGRD METER/RANGE/PPM                 6.2/ 1/   6.        6.3/ 1/   6.        6.3/ 1/   6.
  CO   SAMPLE METER/RANGE/PPM                32.6/13/  30.       17.6/13/  16.       23.6/13/  22.
  CO   BCKGRD METER/RANGE/PPM                 2.0/13/   2.        1.6/13/   1.        1.0/13/   1.
  CO2  SAMPLE METER/RANGE/PCT                43.3/ 3/  .74       24.4/ 3/  .40       37.1/ 3/  .62
  CO2  BCKGRD METER/RANGE/PCT                 3.1/ 3/  .05        3.2/ 3/  .05        3.2/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM                14.4/ 2/  14.        9.9/ 2/  10.       15.3/ 2/  15.
  NOX  BCKGRD METER/RANGE/PPM                  .3/ 2/   0.         .4/ 2/   0.        1.0/ 2/   1.
  DILUTION FACTOR                                17.99               33.45               21.33
  HC   CONCENTRATION PPM                         19.                 12.                 14.
  CO   CONCENTRATION PPM                         27.                 14.                 20.
  CO2  CONCENTRATION PCT                          .69                 .35                 .58
  NOX  CONCENTRATION PPM                         14.1                 9.5                14.3
  HC   MASS GRAMS                                 1.44                1.62                1.10
  CO   MASS GRAMS                                 4.28                3.85                3.13
  CO2  MASS GRAMS                              1703.6              1486.7              1414.9
  NOX  MASS GRAMS                                 3.53                4.13                3.59
  PARTICULATE MASS GRAMS                          1.80                1.26                1.19

  HC   GRAMS/KM                                    .25                 .27                 .19
  CO   GRAMS/KM                                    .75                 .63                 .55
  CO2  GRAMS/KM                                 297.4               242.8               247.0
  NOX  GRAMS/KM                                    .62                 .67                 .63
  FUEL CONSUMPTION BY CB L/100KM                 11.13                9.10                9.24
  RUN TIME             SECONDS                  505.                867.                505.
  MEASURED DISTANCE    KM                         5.73                6.12                5.73
  DFC, DRY                                         .977                .980                .978

COMPOSITE RESULTS
  TEST NUMBER            6441-3                                                              3-BAG       (4-BAG)
  BAROMETER     MM HG    740.2                    CARBON DIOXIDE          G/KM              255.3       (   0.0)
  HUMIDITY      G/KG      10.0                    FUEL CONSUMPTION        L/100KM             9.56      (   0.00)
  TEMPERATURE   DEG C     25.0                    HYDROCARBONS (THC)      G/KM                 .24      (   0.00)
                                                  CARBON MONOXIDE         G/KM                 .63      (   0.00)
                                                  OXIDES OF NITROGEN      G/KM                 .65      (   0.00)
                                                  PARTICULATES            G/KM                 .229     ( 0.000)
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                                              HFET   VEHICLE EMISSIONS RESULTS  - W/O WATER INJECTION
                                                          PROJECT 11-5810-001

  TEST NO.   6441-3   RUN   1                           VEHICLE NO.64                      TEST WEIGHT  1814. KG( 4000. LBS)
  VEHICLE MODEL   81 MERCEDES  300SD                    DATE     2/25/81                   ACTUAL ROAD LOAD   8.6 KW( 11.5 HP)
  ENGINE 3.0 L(186. CID) L-5                            BAG CART NO.  1                    DIESEL    EM-465-F
  TRANSMISSION A3                                       DYNO NO.      2                    ODOMETER  3135. KM( 1948. MILES)
                                                        CVS NO.   3

  BAROMETER 739.65 MM HG(29.12 IN HG)                   DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
  RELATIVE HUMIDITY  49. PCT                            ABS. HUMIDITY 10.0 GM/KG           NOX HUMIDITY CORRECTION FACTOR   .98
0 BAG RESULTS
    TEST CYCLE                                             HFET

    BLOWER DIF P MM. H2O(IN. H2O)                       713.7 (28.1)
    BLOWER INLET P MM. H2O(IN. H2O)                     581.7 (22.9)
    BLOWER INLET TEMP. DEG. C(DEG. F)                    36.7 ( 98.0)
    BLOWER REVOLUTIONS                                     21024.
    TOT FLOW STD. CU. METRES(SCF)                       201.7 ( 7121.)
    HC  SAMPLE METER/RANGE/PPM                          22.5/11/  23.
    HC  BCKGRD METER/RANGE/PPM                           4.5/ 1/   5.
    CO  SAMPLE METER/RANGE/PPM                          37.0/13/  34.
    CO  BCKGRD METER/RANGE/PPM                            .4/13/   0.
    CO2 SAMPLE METER/RANGE/PCT                          57.1/ 3/ 1.01
    CO2 BCKGRD METER/RANGE/PCT                           3.8/ 3/  .06
    NOX SAMPLE METER/RANGE/PPM                          18.7/ 2/  19.
    NOX BCKGRD METER/RANGE/PPM                           1.5/ 2/   2.
    DILUTION FACTOR                                        13.25
    HC  CONCENTRATION PPM                                    18.
    CO  CONCENTRATION PPM                                    33.
    CO2 CONCENTRATION PCT                                    .95
    NOX CONCENTRATION PPM                                  17.3
    HC  MASS GRAMS                                          2.14
    CO  MASS GRAMS                                          7.69
    CO2 MASS GRAMS                                       3513.9
    NOX MASS GRAMS                                          6.53
    RUN TIME                  SECONDS                      766.
         DFC, WET (DRY)                                 .925 ( .910)
         SCF, WET (DRY)                                1.000 ( .975)
         VOL (SCM)                                        201.7
         SAM BLR (SCM)                                    41.99
         KM  (MEASURED)                                   16.32

    TEST NUMBER,                                         6441-3
    BAROMETER,               MM HG                        739.6
    HUMIDITY,                G/KG                          10.0
    TEMPERATURE,             DEG C                         25.0
     CARBON DIOXIDE,          G/KM                         215.3
    FUEL CONSUMPTION,        L/100KM                        8.05

    HYDROCARBONS,            G/KM                           .13
    CARBON MONOXIDE,         G/KM                           .47
    OXIDES OF NITROGEN,      G/KM                           .40
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                                          FTP   VEHICLE EMISSIONS RESULTS - WITH WATER INJECTION
                                                 PROJECT 11-5810-001

TEST NO.   6441C1   RUN   1                     VEHICLE NO.64                              TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   81 MERCEDES                     DATE    3/ 3/81                            ACTUAL ROAD LOAD   8.6 KW( 11.5 HP)
ENGINE 3.0 L(183. CID) L-5                      BAG CART NO.  1                            DIESEL    EM-465-F
TRANSMISSION A3                                 DYNO NO.      2                            ODOMETER  3161. KM( 1964. MILES)
                                                CVS NO.   3

BAROMETER 731.77 MM HG(28.81 IN HG)             DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  56. PCT                      ABS. HUMIDITY 11.6 GM/KG                   NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
  BAG NUMBER                                         1                     2                     3
  DESCRIPTION                                  COLD TRANSIENT         STABILIZED           HOT TRANSIENT          STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                 711.2 (28.0)          711.2 (28.0)          711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)               571.5 (22.5)          571.5 (22.5)          571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)              35.6 ( 96.0)          33.9 ( 93.0)          35.0 ( 95.0)
  BLOWER REVOLUTIONS                               13877.                23870.                13846.
  TOT FLOW STD. CU. METRES(SCF)                 133.1 ( 4699.)        229.6 ( 8108.)        132.9 ( 4693.)
  HC  SAMPLE METER/RANGE/PPM                    24.9/11/  25.         16.1/11/  16.         18.0/11/  18.
  HC  BCKGRD METER/RANGE/PPM                     4.6/ 1/   5.          4.7/ 1/   5.          4.7/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                    43.5/13/  41.         24.2/13/  22.         33.3/13/  31.
  CO  BCKGRD METER/RANGE/PPM                      .8/13/   1.          1.0/13/   1.          1.3/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                    46.6/ 3/  .80         27.0/ 3/  .44         40.5/ 3/  .69
  CO2 BCKGRD METER/RANGE/PCT                     3.1/ 3/  .05          2.9/ 3/  .04          3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                    11.1/ 2/  11.          7.7/ 2/   8.         10.5/ 2/  11.
  NOX BCKGRD METER/RANGE/PPM                      .3/ 2/   0.           .4/ 2/   0.           .5/ 2/   1.
  DILUTION FACTOR                                  16.58                 30.02                 19.37
  HC  CONCENTRATION PPM                            21.                   12.                   14.
  CO  CONCENTRATION PPM                            39.                   21.                   29.
  CO2 CONCENTRATION PCT                            .76                   .40                   .64
  NOX CONCENTRATION PPM                            10.8                  7.3                   10.0
  HC  MASS GRAMS                                   1.58                  1.53                  1.04
  CO  MASS GRAMS                                   5.99                  5.52                  4.44
  CO2 MASS GRAMS                                 1845.5                1680.4                1562.4
  NOX MASS GRAMS                                   2.84                  3.31                  2.63

  HC  GRAMS/KM                                     .27                   .24                   .18
  CO  GRAMS/KM                                     1.03                  .88                   .75
  CO2 GRAMS/KM                                    316.1                 266.5                 265.6
  NOX GRAMS/KM                                     .49                   .52                   .45
  FUEL CONSUMPTION BY CB L/100KM                  11.85                  9.99                  9.94
  RUN TIME              SECONDS                   505.                  869.                  504.
  MEASURED DISTANCE     KM                        5.84                  6.31                  5.88
  SCF, DRY                                        .974                  .978                  .975

COMPOSITE RESULTS
  TEST NUMBER               6441C1                                                     3-BAG        (4-BAG)
  BAROMETER      MM HG      731.8                   CARBON DIOXIDE         G/KM        276.5        (   0.0)
  HUMIDITY       G/KG        11.6                   FUEL CONSUMPTION       L/100KM     10.36        (  0.00)
  TEMPERATURE    DEG C       25.0                   HYDROCARBONS (THC)     G/KM          .23        (  0.00)
                                                    CARBON MONOXIDE        G/KM          .87        (  0.00)
                                                    OXIDES OF NITROGEN     G/KM          .50        (  0.00)
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                                                   HFET   VEHICLE EMISSIONS RESULTS - WITH WATER INJECTION
                                                             PROJECT 11-5810-001
   TEST NO.   6441C1   RUN   1
   VEHICLE MODEL   81 MERCEDES                          VEHICLE NO.64
   ENGINE 3.0 L(183. CID) L-5                           DATE     3/ 3/81                    TEST WEIGHT  1814. KG( 4000. LBS)
   TRANSMISSION A3                                      BAG CART NO.  1                     ACTUAL ROAD LOAD    8.6 KW( 11.5 HP)
                                                        DYNO NO.      2                     DIESEL     EM-465-F
   BAROMETER 730.50 MM HG(28.76 IN HG)                  CVS NO.    3                        ODOMETER  3178. KM( 1975. MILES)
   RELATIVE HUMIDITY  45. PCT
 0 BAG RESULTS                                          DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)
     TEST CYCLE                                         ABS. HUMIDITY 10.7 GM/KG
                                                                                            NOX HUMIDITY CORRECTION FACTOR  1.00
     BLOWER DIF P MM. H2O(IN. H2O)                         HFET
     BLOWER INLET P MM. H2O(IN. H2O)                    711.2 (28.0)
     BLOWER INLET TEMP. DEG. C(DEG. F)                  571.5 (22.5)
     BLOWER REVOLUTIONS                                  39.4 (103.0)
     TOT FLOW STD. CU. METRES(SCF)                        21011.
     HC  SAMPLE METER/RANGE/PPM                         198.8 ( 7019.)
     HC  BCKGRD METER/RANGE/PPM                         21.3/11/  21.
     CO  SAMPLE METER/RANGE/PPM                          4.8/ 1/   5.
     CO  BCKGRD METER/RANGE/PPM                         47.6/13/  45.
     CO2 SAMPLE METER/RANGE/PCT                          1.6/13/   1.
     CO2 BCKGRD METER/RANGE/PCT                         61.8/ 3/ 1.10
     NOX SAMPLE METER/RANGE/PPM                          3.1/ 3/  .05
     NOX BCKGRD METER/RANGE/PPM                         14.6/ 2/  15.
     DILUTION FACTOR                                      .8/ 2/   1.
     HC  CONCENTRATION PPM                                 12.12
     CO  CONCENTRATION PPM                                  17.
     CO2 CONCENTRATION PCT                                  42.
     NOX CONCENTRATION PPM                                 1.06
     HC  MASS GRAMS                                        13.9
     CO  MASS GRAMS                                         1.94
     CO2 MASS GRAMS                                         9.68
     NOX MASS GRAMS                                      3840.4
     RUN TIME                  SECONDS                      5.26
          DFC, WET (DRY)                                   765.
          SCF, WET (DRY)                                .918 ( .904)
          VOL (SCM)                                    1.000 ( .975)
          SAM BLR (SCM)                                    198.8
          KM  (MEASURED)                                   42.22
                                                           16.68
   TEST NUMBER,
   BAROMETER,                 MM HG                    6441C1
   HUMIDITY,                  G/KG                      730.5
   TEMPERATURE,               DEG C                      10.7
     CARBON DIOXIDE,           G/KM                      27.2
   FUEL CONSUMPTION,          L/100KM                   230.2
                                                         8.61
   HYDROCARBONS,              G/KM
   CARBON MONOXIDE,           G/KM                        .12
   OXIDES OF NITROGEN,        G/KM                        .58
                                                          .32
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                           FTP    VEHICLE EMISSIONS RESULTS - WITH WATER INJECTION
                                   PROJECT 11-5810-  1

TEST NO.   6441C2   RUN   1                 VEHICLE NO.64                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   81 MERCEDES  300SD          DATE    3/ 5/81                      ACTUAL ROAD LOAD   8.6 KW( 11.5 HP)
ENGINE 3.0 L(183. CID) V-8                  BAG CART NO.  1                      DIESEL     EM-465-F
TRANSMISSION A3                             DYNO NO.      2                      ODOMETER  3233. KM( 2009. MILES)
                                            CVS NO.   3

BAROMETER 741.43 MM HG(29.19 IN HG)         DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  39. PCT                  ABS. HUMIDITY  7.9 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .92
BAG RESULTS
   BAG NUMBER                                     1               2                  3
   DESCRIPTION                              COLD TRANSIENT    STABILIZED       HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            711.2 (28.0)     721.4 (28.4)      713.7 (28.1)
   BLOWER INLET P MM. H2O(IN. H2O)          571.5 (22.5)     584.2 (23.0)      581.7 (22.9)
   BLOWER INLET TEMP. DEG. C(DEG. F)         34.4 ( 94.0)     29.4 ( 85.0)      33.3 ( 92.0)
   BLOWER REVOLUTIONS                         13876.           23816.            13878.
   TOT FLOW STD. CU. METRES(SCF)            135.6 ( 4788.)   235.2 ( 8306.)    135.8 ( 4794.)
   HC  SAMPLE METER/RANGE/PPM               18.9/11/  19.    11.0/11/  11.     12.4/11/  12.
   HC  BCKGRD METER/RANGE/PPM                2.1/ 1/   2.     1.8/ 1/   2.      1.8/ 1/   2.
   CO  SAMPLE METER/RANGE/PPM               40.2/13/  37.    21.8/13/  20.     29.3/13/  27.
   CO  BCKGRD METER/RANGE/PPM                .5/13/   0.      .5/13/   0.       .5/13/   0.
   CO2 SAMPLE METER/RANGE/PCT               43.7/ 3/  .75    24.7/ 3/  .40     38.7/ 3/  .65
   CO2 BCKGRD METER/RANGE/PCT                3.0/ 3/  .05     2.8/ 3/  .04      3.6/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM               12.2/ 2/  12.     8.2/ 2/   8.     11.9/ 2/  12.
   NOX BCKGRD METER/RANGE/PPM                .5/ 2/   1.      .6/ 2/   1.       .6/ 2/   1.
   DILUTION FACTOR                            17.81            33.05             20.38
   HC  CONCENTRATION PPM                      17.               9.               11.
   CO  CONCENTRATION PPM                      36.              19.               26.
   CO2 CONCENTRATION PCT                       .70              .36               .60
   NOX CONCENTRATION PPM                      11.7              7.6              11.3
   HC  MASS GRAMS                              1.32             1.26              .84
   CO  MASS GRAMS                              5.68             5.21             4.08
   CO2 MASS GRAMS                           1746.8           1554.1           1494.3
   NOX MASS GRAMS                              2.79             3.14             2.70
   PARTICULATE MASS GRAMS                      1.49             1.52             1.30

   HC  GRAMS/KM                                .23              .20               .14
   CO  GRAMS/KM                                .98              .84               .70
   CO2 GRAMS/KM                              301.3            249.5            256.3
   NOX GRAMS/KM                                .48              .50               .46
   FUEL CONSUMPTION BY CB L/100KM            11.29             9.35             9.59
   RUN TIME              SECONDS             505.             867.             505.
   MEASURED DISTANCE     KM                   5.80             6.23             5.83
   SCF, DRY                                   .980             .984             .981

COMPOSITE RESULTS                                                                              3-BAG        (4-BAG)
   TEST NUMBER         6441C2                                CARBON DIOXIDE        G/KM       262.1       (   0.0)
   BAROMETER    MM HG  741.4                                 FUEL CONSUMPTION      L/100KM      9.82      (  0.00)
   HUMIDITY     G/KG     7.9                                 HYDROCARBONS (THC)    G/KM         .19       (  0.00)
   TEMPERATURE  DEG C   25.0                                 CARBON MONOXIDE       G/KM         .83       (  0.00)
                                                             OXIDES OF NITROGEN    G/KM         .49       (  0.00)
                                                             PARTICULATES          G/KM         .241      ( 0.000)
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APPENDIX G

DURABILITY OF CORNING TRAP ON THE MERCEDES

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                                         FTP    VEHICLE EMISSIONS RESULTS
                                                 PROJECT 05-5810-001

TEST NO.   6100-1   RUN   1
VEHICLE MODEL   80 MERCEDES 300D                 VEHICLE NO.61
ENGINE 3.0 L(183. CID) L-5                       DATE    8/31/81                       TEST WEIGHT    181. KG(  400. LBS)
TRANSMISSION A3                                  BAG CART NO. 1 / CVS NO.  3           ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
                                                 DYNO NO.      2                       DIESEL     EM-465-F
BAROMETER 734.06 MM HG(28.90 IN HG)                                                    ODOMETER  9693. KM( 6023. MILES)
RELATIVE HUMIDITY  63. PCT                       DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
BAG RESULTS                                      ABS. HUMIDITY 13.1 GM/KG
  BAG NUMBER                                                                           NOX HUMIDITY CORRECTION FACTOR  1.08
  DESCRIPTION                                         1                   2                   3                    4
                                                 COLD TRANSIENT       STABILIZED         HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                  693.4 (27.3)        693.4 (27.3)        693.4 (27.3)         693.4 (27.3)
  BLOWER INLET P MM. H2O(IN. H2O)                566.4 (22.3)        566.4 (22.3)        566.4 (22.3)         566.4 (22.3)
  BLOWER INLET TEMP. DEG. C(DEG. F)               36.1 ( 97.0)        35.0 ( 95.0)        36.7 ( 98.0)         34.4 ( 94.0)
  BLOWER REVOLUTIONS                               13865.              23820.              13862.               23808.
  TOT FLOW STD. CU. METRES(SCF)                  133.7 ( 4720.)      230.1 ( 8125.)      133.6 ( 4716.)       230.2 ( 8129.)
  HC  SAMPLE METER/RANGE/PPM                     14.1/11/  14.       11.0/11/  11.       11.5/11/  11.        10.2/11/  10.
  HC  BCKGRD METER/RANGE/PPM                      6.3/ 1/   6.        5.8/ 1/   6.        5.6/ 1/   6.         5.6/ 1/   6.
  CO  SAMPLE METER/RANGE/PPM                     28.9/13/  27.       17.6/13/  16.       23.2/13/  21.        16.7/13/  15.
  CO  BCKGRD METER/RANGE/PPM                       .1/13/   0.         .3/13/   0.         .6/13/   1.          .4/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                     46.1/ 3/  .79       26.3/ 3/  .43       39.3/ 3/  .66        25.5/ 3/  .42
  CO2 BCKGRD METER/RANGE/PCT                      2.9/ 3/  .04        3.4/ 3/  .05        3.3/ 3/  .05         3.5/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                     24.8/ 2/  25.       13.7/ 2/  14.       23.2/ 2/  23.        13.2/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                       .4/ 2/   0.         .4/ 2/   0.         .4/ 2/   0.          .4/ 2/   0.
  DILUTION FACTOR                                  16.83               30.95               20.06                32.00
  HC  CONCENTRATION PPM                             8.                  5.                  6.                   5.
  CO  CONCENTRATION PPM                            26.                 15.                 20.                  14.
  CO2 CONCENTRATION PCT                             .75                 .38                 .62                  .36
  NOX CONCENTRATION PPM                            24.4                13.3                22.8                 12.8
  HC  MASS GRAMS                                     .63                 .72                 .47                  .63
  CO  MASS GRAMS                                   3.97                4.09                3.10                 3.85
  CO2 MASS GRAMS                                 1837.4              1600.3              1508.0               1535.6
  NOX MASS GRAMS                                   6.77                6.35                6.32                 6.12
  PARTICULATE MASS GRAMS                           2.26                1.69                1.69                 1.53

  HC  GRAMS/KM                                      .11                 .12                 .08                  .10
  CO  GRAMS/KM                                      .69                 .66                 .54                  .61
  CO2 GRAMS/KM                                   317.7               257.9               260.1                243.9
  NOX GRAMS/KM                                     1.17                1.02                1.09                  .97
  FUEL CONSUMPTION BY CB L/100KM                  11.87                9.65                9.71                 9.12

  RUN TIME                   SECONDS             505.                868.                505.                 868.
  MEASURED DISTANCE          KM                  5.78                6.20                5.80                 6.30
  SCF, DRY                                       .972                .976                .973                 .976
        DFC, WET (DRY)                                  .958 ( .938)                              .962 ( .942)
        SCF, WET (DRY)                                 1.000 ( .974)                             1.000 ( .975)
        VOL (SCM)                                              363.8                                     363.8
        SAM BLR (SCM)                                          76.44                                     76.46
        KM  (MEASURED)                                         11.99                                     12.10
        FUEL CONSUMPTION L/100KM                               10.72                                      9.40

COMPOSITE RESULTS
  TEST NUMBER                 6100-1
  BAROMETER       MM HG        734.1                     CARBON DIOXIDE           G/KM       3-BAG      (4-BAG)
  HUMIDITY        G/KG          13.1                     FUEL CONSUMPTION         L/100KM    270.9      ( 266.7)
  TEMPERATURE     DEG C         25.0                     HYDROCARBONS (THC)       G/KM       10.13      (   9.97)
                                                         CARBON MONOXIDE          G/KM        .11       (   .10)
                                                         OXIDES OF NITROGEN       G/KM        .63       (   .62)
                                                         PARTICULATES             G/KM       1.07       (  1.06)
                                                                                              .302      (  .294)
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                                          FTP    VEHICLE EMISSIONS RESULTS
                                                  PROJECT 05-5810-001

TEST NO.   6100-2   RUN                        VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D               DATE     8/27/81                     ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                     BAG CART NO. 1 / CVS NO.  3          DIESEL     EM-465-F
TRANSMISSION A3                                DYNO NO.      2                      ODOMETER  9656. KM( 6000. MILES)

BAROMETER 738.89 MM HG(29.09 IN HG)            DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  63. PCT                     ABS. HUMIDITY 12.5 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.06
BAG RESULTS
  BAG NUMBER                                        1                  2                  3                  4
  DESCRIPTION                                COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               698.5 (27.5)       698.5 (27.5)       696.0 (27.4)       703.6 (27.7)
  BLOWER INLET P MM. H2O(IN. H2O)             571.5 (22.5)       571.5 (22.5)       569.0 (22.4)       576.6 (22.7)
  BLOWER INLET TEMP. DEG. C(DEG. F)            36.7 ( 98.0)       34.4 ( 94.0)       36.1 ( 97.0)       34.4 ( 94.0)
  BLOWER REVOLUTIONS                             13834.             23845.             13837.             23811.
  TOT FLOW STD. CU. METRES(SCF)               134.4 ( 4746.)     232.5 ( 8210.)     134.6 ( 4753.)     232.1 ( 8196.)
  HC  SAMPLE METER/RANGE/PPM                  19.7/11/  20.      15.0/11/  15.      14.2/11/  14.      12.8/11/  13.
  HC  BCKGRD METER/RANGE/PPM                  14.0/ 1/  14.       9.8/ 1/  10.       9.8/ 1/  10.       9.6/ 1/  10.
  CO  SAMPLE METER/RANGE/PPM                  34.0/13/  31.      21.7/13/  20.      25.6/13/  23.      19.1/13/  17.
  CO  BCKGRD METER/RANGE/PPM                   7.5/13/   7.       6.6/13/   6.       4.9/13/   4.       4.2/13/   4.
  CO2 SAMPLE METER/RANGE/PCT                  44.7/ 3/  .77      25.7/ 3/  .42      38.9/ 3/  .66      25.1/ 3/  .41
  CO2 BCKGRD METER/RANGE/PCT                   3.6/ 3/  .06       3.3/ 3/  .05       3.3/ 3/  .05       3.4/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                  23.4/ 2/  23.      13.6/ 2/  14.      23.8/ 2/  24.      13.7/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                    .4/ 2/   0.        .3/ 2/   0.        .5/ 2/   1.        .4/ 2/   0.
  DILUTION FACTOR                                17.38              31.66              20.27              32.50
  HC  CONCENTRATION PPM                            6.                 5.                 5.                 3.
  CO  CONCENTRATION PPM                           24.                14.                19.                13.
  CO2 CONCENTRATION PCT                           .71                .37                .61                .36
  NOX CONCENTRATION PPM                          23.0               13.3               23.3               13.3
  HC  MASS GRAMS                                  .50                .74                .38                .46
  CO  MASS GRAMS                                 3.76               3.67               2.90               3.59
  CO2 MASS GRAMS                               1756.8             1578.7             1501.5             1524.9
  NOX MASS GRAMS                                 6.28               6.28               6.37               6.27
  PARTICULATE MASS GRAMS                         2.11               1.72               1.68               1.55

  HC  GRAMS/KM                                    .09                .12                .07                .08
  CO  GRAMS/KM                                    .66                .60                .51                .58
  CO2 GRAMS/KM                                  308.4              256.6              262.0              246.4
  NOX GRAMS/KM                                   1.10               1.02               1.11               1.01
  FUEL CONSUMPTION BY CB L/100KM                11.52               9.59               9.78               9.21

  RUN TIME                     SECONDS           504.               869.               504.               868.
  MEASURED DISTANCE            KM                5.70               6.15               5.73               6.19
  SCF, DRY                                       .973               .976               .974               .976
       DFC, WET (DRY)                                  .959 ( .939)                          .962 ( .943)
       SCF, WET (DRY)                                 1.000 ( .975)                         1.000 ( .975)
       VOL (SCM)                                             366.9                                 366.7
       SAM BLR (SCM)                                         77.65                                 77.67
       KM  (MEASURED)                                        11.85                                 11.92
       FUEL CONSUMPTION L/100KM                              10.52                                  9.48

COMPOSITE RESULTS
  TEST NUMBER             6100-2                                                             3-BAG        (4-BAG)
  BAROMETER      MM HG    738.9                    CARBON DIOXIDE          G/KM             268.8        ( 265.8)
  HUMIDITY       G/KG      12.5                    FUEL CONSUMPTION        L/100KM          10.04        (  9.93)
  TEMPERATURE    DEG C     24.4                    HYDROCARBONS (THC)      G/KM               .10        (   .09)
                                                   CARBON MONOXIDE         G/KM               .59        (   .58)
                                                   OXIDES OF NITROGEN      G/KM              1.06        (  1.06)
                                                   PARTICULATES            G/KM              .302        (  .294)
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                                   FTP   - VEHICLE EMISSIONS RESULTS -TEST 6100T2
                                            PROJECT 05-5810-001

TEST NO.   6100T2   RUN   1                 VEHICLE NO.61                       TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES3 OOD            DATE     9/ 4/81                    ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                  BAG CART NO. 1 / CVS NO.  3         DIESEL     EM-465-F
TRANSMISSION A3                             DYNO NO.       2                    ODOMETER  9799. KM( 6089. MILES)

BAROMETER 740.66 MM HG(29.16 IN HG)         DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  67. PCT                  ABS. HUMIDITY 13.7 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.11
BAG RESULTS
  BAG NUMBER                                      1               2                   3                4
  DESCRIPTION                              COLD TRANSIENT     STABILIZED        HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)            690.9 (27.2)      703.6 (27.7)       690.9 (27.2)      698.5 (27.5)
  BLOWER INLET P MM. H2O(IN. H2O)          563.9 (22.2)      576.6 (22.7)       563.9 (22.2)      571.5 (22.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)         36.7 ( 98.0)      35.0 ( 95.0)       36.7 ( 98.0)      35.0 ( 95.0)
  BLOWER REVOLUTIONS                          13848.            23802.             13838.            23807.
  TOT FLOW STD. CU. METRES(SCF)            134.8 ( 4760.)    232.0 ( 8192.)     134.7 ( 4756.)    232.2 ( 8197.)
  HC   SAMPLE METER/RANGE/PPM              14.4/11/  14.     12.0/11/  12.      11.9/11/  12.     10.3/11/  10.
  HC   BCKGRD METER/RANGE/PPM              11.3/ 1/  11.      8.7/ 1/   9.       6.7/ 1/   7.      6.7/ 1/   7.
  CO   SAMPLE METER/RANGE/PPM              34.9/13/  32.     24.3/13/  22.      27.2/13/  25.     21.2/13/  19.
  CO   BCKGRD METER/RANGE/PPM               9.3/13/   8.      8.3/13/   7.       6.3/13/   6.      5.9/13/   5.
  CO2  SAMPLE METER/RANGE/PCT              46.6/ 3/  .80     26.8/ 3/  .44      40.1/ 3/  .68     25.9/ 3/  .42
  CO2  BCKGRD METER/RANGE/PCT               3.6/ 3/  .06      3.3/ 3/  .05       3.5/ 3/  .05      3.4/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM              24.0/ 2/  24.     13.5/ 2/  14.      24.1/ 2/  24.     14.0/ 2/  14.
  NOX  BCKGRD METER/RANGE/PPM                .1/ 2/   0.       .2/ 2/   0.        .5/ 2/   1.       .4/ 2/   0.
  DILUTION FACTOR                             16.61             30.29              19.61             31.44
  HC   CONCENTRATION PPM                        4.                4.                 6.                4.
  CO   CONCENTRATION PPM                       23.               14.                19.               14.
  CO2  CONCENTRATION PCT                       .75               .39                .63               .37
  NOX  CONCENTRATION PPM                      23.9              13.3               23.6              13.6
  FILTER WT. MG (EFFICIENCY, %)            .224 (77.)        .209 (76.)         .150 (80.)        .180 (73.)
  HC   MASS GRAMS                              .29               .48                .43               .52
  CO   MASS GRAMS                             3.66              3.90               2.95              3.70
  CO2  MASS GRAMS                           1851.3            1657.4             1550.3            1584.8
  NOX  MASS GRAMS                             6.84              6.55               6.75              6.71
  PARTICULATE MASS GRAMS                       .18               .17                .11               .15

  HC   GRAMS/KM                                .05               .08                .07               .08
  CO   GRAMS/KM                                .63               .63                .51               .59
  CO2  GRAMS/KM                              319.5             266.8              268.0             254.4
  NOX  GRAMS/KM                               1.18              1.05               1.17              1.08
  FUEL CONSUMPTION BY CB L/100KM             11.93              9.97              10.01              9.51

  RUN TIME               SECONDS              505.              868.               504.              868.
  MEASURED DISTANCE      KM                   5.79              6.21               5.78              6.23
  SCF, DRY                                    .971      .973    .974               .972      .974    .974
       DFC, WET (DRY)                              .957( .936)                          .961( .940)
       TOT VOL (SCM) / SAM BLR (SCM)              366.8/ 77.24                         366.8/ 77.21
       KM  (MEASURED)                                12.01                                12.01
       FUEL CONSUMPTION L/100KM                      10.91                                 9.75

COMPOSITE RESULTS                                                                                3-BAG      (4-BAG)
  TEST NUMBER           6100T2                              CARBON DIOXIDE         G/KM         278.1     ( 274.4)
  BAROMETER     MM HG   740.7                               FUEL CONSUMPTION       L/100KM      10.39     ( 10.25)
  HUMIDITY      G/KG     13.7                               HYDROCARBONS (THC)     G/KM           .07     (   .07)
  TEMPERATURE   DEG C    25.0                               CARBON MONOXIDE        G/KM           .60     (   .59)
                                                            OXIDES OF NITROGEN     G/KM          1.11     (  1.12)
                                                            PARTICULATES           G/KM          .026     (  .025)
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                         FTP    VEHICLE EMISSIONS RESULTS
                                 PROJECT 05-5810-001

TEST NO.   6100T3   RUN   1                   VEHICLE NO.61                           TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D              DATE     9/ 8/81                        ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                    BAG CART NO. 1 / CVS NO.  3             DIESEL     EM-465-F
TRANSMISSION A3                               DYNO NO.       2                        ODOMETER  9897. KM( 6150. MILES)

BAROMETER 742.70 MM HG(29.24 IN HG)           DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  60. PCT                    ABS. HUMIDITY 12.1 GM/KG                NOX HUMIDITY CORRECTION FACTOR  1.05
BAG RESULTS
  BAG NUMBER                                     1                  2                  3                  4
  DESCRIPTION                              COLD TRANSIENT      STABILIZED        HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             690.9 (27.2)       698.5 (27.5)       698.5 (27.5)       703.6 (27.7)
  BLOWER INLET P MM. H2O(IN. H2O)           563.9 (22.2)       571.5 (22.5)       571.5 (22.5)       576.6 (22.7)
  BLOWER INLET TEMP. DEG. C(DEG. F)          36.7 ( 98.0)       35.0 ( 95.0)       36.7 ( 98.0)       35.0 ( 95.0)
  BLOWER REVOLUTIONS                          13871.             23821.             13856.             23804.
  TOT FLOW STD. CU. METRES(SCF)             135.4 ( 4782.)     233.0 ( 8228.)     135.2 ( 4775.)     232.8 ( 8220.)
  HC   SAMPLE METER/RANGE/PPM               12.1/11/  12.       8.4/11/   8.       9.6/11/  10.       8.3/11/   8.
  HC   BCKGRD METER/RANGE/PPM                5.5/ 1/   6.       5.1/ 1/   5.       4.8/ 1/   5.       4.8/ 1/   5.
  CO   SAMPLE METER/RANGE/PPM               34.2/13/  32.      22.5/13/  21.      25.8/13/  24.      19.3/13/  18.
  CO   BCKGRD METER/RANGE/PPM                6.5/13/   6.       6.2/13/   6.       4.3/13/   4.       3.6/13/   3.
  CO2  SAMPLE METER/RANGE/PCT               46.6/ 3/  .80      26.9/ 3/  .44      39.6/ 3/  .67      25.9/ 3/  .42
  CO2  BCKGRD METER/RANGE/PCT                3.5/ 3/  .05       3.4/ 3/  .05       3.4/ 3/  .05       3.8/ 3/  .06
  NOX  SAMPLE METER/RANGE/PPM               23.1/ 2/  23.      13.7/ 2/  14.      23.0/ 2/  23.      13.5/ 2/  14.
  NOX  BCKGRD METER/RANGE/PPM                 .5/ 2/   1.        .4/ 2/   0.        .5/ 2/   1.        .5/ 2/   1.
  DILUTION FACTOR                              16.62              30.20              19.89              31.47
  HC   CONCENTRATION PPM                        7.                 3.                 5.                 4.
  CO   CONCENTRATION PPM                       25.                15.                19.                14.
  CO2  CONCENTRATION PCT                         .75                .39                .62                .37
  NOX  CONCENTRATION PPM                       22.6               13.3               22.5               13.0
  HC   MASS GRAMS                                .54                .46                .39                .49
  CO   MASS GRAMS                               3.96               3.98               3.03               3.79
  CO2  MASS GRAMS                            1863.6             1665.8             1536.9             1563.5
  NOX  MASS GRAMS                               6.15               6.23               6.11               6.08
  PARTICULATE MASS GRAMS                         .21                .22                .20                .20

  HC   GRAMS/KM                                  .09                .07                .07                .08
  CO   GRAMS/KM                                  .68                .64                .52                .61
  CO2  GRAMS/KM                               321.5              267.4              264.6              249.6
  NOX  GRAMS/KM                                 1.06               1.00               1.05                .97
  FUEL CONSUMPTION BY CB L/100KM               12.01               9.99               9.88               9.33

  RUN TIME              SECONDS               505.               868.               505.               868.
  MEASURED DISTANCE     KM                      5.80               6.23               5.81               6.26
  SCF, DRY                                       .973               .977               .975               .977
       DFC, WET (DRY)                                    .957 ( .939)                          .961 ( .943)
       SCF, WET (DRY)                                   1.000 ( .975)                         1.000 ( .976)
       VOL (SCM)                                                368.5                                368.0
       SAM BLR (SCM)                                             78.11                                78.12
       KM  (MEASURED)                                            12.03                                12.07
       FUEL CONSUMPTION L/100KM                                  10.96                                 9.60

COMPOSITE RESULTS
  TEST NUMBER                6100T3                                                                3-BAG        (4-BAG)
  BAROMETER      MM HG     742.7                     CARBON DIOXIDE          G/KM                 277.8       ( 272.6)
  HUMIDITY       G/KG       12.1                     FUEL CONSUMPTION        L/100KM               10.38       ( 10.18)
  TEMPERATURE    DEG C      25.0                     HYDROCARBONS (THC)      G/KM                    .08       (   .08)
                                                     CARBON MONOXIDE         G/KM                    .62       (   .61)
                                                     OXIDES OF NITROGEN      G/KM                   1.03       (  1.02)
                                                     PARTICULATES            G/KM                   .035       (  .034)
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                                     FTP   - VEHICLE EMISSIONS RESULTS -
                                             PROJECT 05-5810-001

TEST NO.   6105-1   RUN   1
VEHICLE MODEL   80 MERCEDES 300D             VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                   DATE    11/13/81                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                              BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-465-F
                                             DYNO NO.      2                        ODOMETER 18845. KM(11710. MILES)

BARDMETER 744.73 MM HG(29.32 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  46. PCT                   ABS. HUMIDITY  9.2 GM/KG
BAG RESULTS                                                                         NOX HUMIDITY CORRECTION FACTOR   .95
  BAG NUMBER                                       1               2                  3                 4
  DESCRIPTION                               COLD TRANSIENT      STABILIZED        HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              723.9 (28.5)      723.9 (28.5)      723.9 (28.5)      723.9 (28.5)
  BLOWER INLET P MM. H2O(IN. H2O)            586.7 (23.1)      586.7 (23.1)      586.7 (23.1)      586.7 (23.1)
  BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)      35.0 ( 95.0)      36.7 ( 98.0)      34.4 ( 94.0)
  BLOWER REVOLUTIONS                           13845.            23808.            13839.            23808.
  TOT FLOW STD. CU. METRES(SCF)              135.3 ( 4777.)    233.0 ( 8229.)    135.1 ( 4770.)    233.3 ( 8237.)
  HC  SAMPLE METER/RANGE/PPM                 17.5/11/  18.     10.1/11/  10.     11.0/11/  11.      9.7/11/  10.
  HC  BCKGRD METER/RANGE/PPM                  6.1/ 1/   6.      6.0/ 1/   6.      6.0/ 1/   6.      6.5/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM                 33.1/13/  31.     18.6/13/  17.     24.9/13/  23.     18.3/13/  17.
  CO  BCKGRD METER/RANGE/PPM                  2.2/13/   2.      2.3/13/   2.      2.2/13/   2.      2.4/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                 45.2/ 3/  .78     25.5/ 3/  .42     38.2/ 3/  .64     24.5/ 3/  .40
  CO2 BCKGRD METER/RANGE/PCT                  3.2/ 3/  .05      3.0/ 3/  .05      2.9/ 3/  .04      2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                 24.5/ 2/  25.     14.1/ 2/  14.     23.9/ 2/  24.     13.9/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                   .4/ 2/   0.       .2/ 2/   0.       .6/ 2/   1.       .6/ 2/   1.
  DILUTION FACTOR                               17.18             31.98             20.69             33.38
  HC  CONCENTRATION PPM                          12.                4.                5.                3.
  CO  CONCENTRATION PPM                          28.               15.               20.               14.
  CO2 CONCENTRATION PCT                          .73               .37               .60               .36
  NOX CONCENTRATION PPM                          24.1              13.9              23.3              13.3
  FILTER WT. MG (EFFICIENCY, %)              3.241 (98.)       2.733 (98.)       2.784 (99.)       2.563 (98.)
  HC  MASS GRAMS                                 .92               .57               .41               .45
  CO  MASS GRAMS                                 4.38              3.95              3.19              3.85
  CO2 MASS GRAMS                               1806.0            1586.5            1489.5            1526.2
  NOX MASS GRAMS                                 5.95              5.91              5.75              5.66
  PARTICULATE MASS GRAMS                         1.97              1.65              1.70              1.57

  HC  GRAMS/KM                                   .16               .09               .07               .07
  CO  GRAMS/KM                                   .76               .63               .55               .62
  CO2 GRAMS/KM                                 311.7             254.0             257.7             245.5
  NOX GRAMS/KM                                  1.03               .95               .99               .91
  FUEL CONSUMPTION BY CB L/100KM               11.66              9.49              9.63              9.18

  RUN TIME              SECONDS                505.              868.              504.              868.
  MEASURED DISTANCE     KM                      5.79              6.25              5.78              6.22
  SCF, DRY                                      .978              .981              .979              .982
       DFC, WET (DRY)                                   .980                                .981
       TOT VOL (SCM) / SAM BLR (SCM)                .959( .945)                         .963( .949)
       KM  (MEASURED)                              368.3/ 78.07                        368.4/ 78.03
       FUEL CONSUMPTION L/100KM                         12.04                               12.00
                                                        10.54                                9.39
COMPOSITE RESULTS
  TEST NUMBER             6105-1                                                               3-BAG     (4-BAG)
  BAROMETER     MM HG    744.7                       CARBON DIOXIDE          G/KM              267.0     ( 264.5)
  HUMIDITY      G/KG       9.2                       FUEL CONSUMPTION        L/100KM           9.98      (  9.88)
  TEMPERATURE   DEG C     25.0                       HYDROCARBONS (THC)      G/KM               .10      (   .09)
                                                     CARBON MONOXIDE         G/KM               .64      (   .63)
                                                     OXIDES OF NITROGEN      G/KM               .98      (   .97)
                                                     PARTICULATES            G/KM              .288      (  .285)
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                                   FTP   - VEHICLE EMISSIONS RESULTS -
                                            PROJECT 05-5810-001

TEST NO.   6105-2   RUN   1                  VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE    11/16/81                     ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3          DIESEL     EM-465-F
TRANSMISSION A3                              DYNO NO.      2                      ODOMETER 18882. KM(11733. MILES)

BAROMETER 741.17 MM HG(29.18 IN HG)          DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
RELATIVE HUMIDITY  58. PCT                   ABS. HUMIDITY 10.7 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                                        1                 2                  3                 4
  DESCRIPTION                                COLD TRANSIENT       STABILIZED       HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              736.6 (29.0)      736.6 (29.0)      736.6 (29.0)      736.6 (29.0)
  BLOWER INLET P MM. H2O(IN. H2O)            604.5 (23.8)      604.5 (23.8)      604.5 (23.8)      604.5 (23.8)
  BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)      33.9 ( 93.0)      36.7 ( 98.0)      33.9 ( 93.0)
  BLOWER REVOLUTIONS                            13849.            23808.            13840.            23829.
  TOT FLOW STD. CU. METRES(SCF)              134.5 ( 4749.)    232.1 ( 8196.)    134.3 ( 4742.)    232.3 ( 8204.)
  HC  SAMPLE METER/RANGE/PPM                 16.4/11/  16.     10.6/11/  11.     11.0/11/  11.      9.2/11/   9.
  HC  BCKGRD METER/RANGE/PPM                  4.3/ 1/   4.      5.4/ 1/   5.      5.4/ 1/   5.      5.0/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                 31.9/13/  29.     18.2/13/  17.     24.7/13/  23.     16.8/13/  15.
  CO  BCKGRD METER/RANGE/PPM                   .9/13/   1.      1.0/13/   1.      1.0/13/   1.      1.1/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                 44.3/ 3/  .76     25.1/ 3/  .41     37.3/ 3/  .63     24.0/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                  2.7/ 3/  .04      2.5/ 3/  .04      2.7/ 3/  .04      2.4/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                 24.4/ 2/  24.     13.6/ 2/  14.     22.4/ 2/  22.     13.1/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                   .3/ 2/   0.       .3/ 2/   0.       .3/ 2/   0.       .5/ 2/   1.
  DILUTION FACTOR                                17.57             32.52             21.23             34.13
  HC  CONCENTRATION PPM                          12.               5.                6.                4.
  CO  CONCENTRATION PPM                          28.               15.               21.               14.
  CO2 CONCENTRATION PCT                           .72               .37               .59               .35
  NOX CONCENTRATION PPM                          24.1              13.3              22.1              12.6
  FILTER WT. MG (EFFICIENCY, %)               3.393 (99.)       2.732 (98.)       2.843 (98.)       2.489 (98.)
  HC  MASS GRAMS                                  .95               .72               .45               .58
  CO  MASS GRAMS                                 4.33              4.12              3.29              3.76
  CO2 MASS GRAMS                               1771.3            1582.1            1447.0            1508.5
  NOX MASS GRAMS                                 6.20              5.91              5.68              5.60
  PARTICULATE MASS GRAMS                         2.02              1.61              1.70              1.51

  HC  GRAMS/KM                                    .17               .12               .08               .09
  CO  GRAMS/KM                                    .75               .67               .57               .61
  CO2 GRAMS/KM                                  307.1             256.9             252.6             244.7
  NOX GRAMS/KM                                   1.08               .96               .99               .91
  FUEL CONSUMPTION BY CB L/100KM                11.49              9.61              9.44              9.15

  RUN TIME               SECONDS                505.              868.              504.              869.
  MEASURED DISTANCE      KM                      5.77              6.16              5.73              6.17
  SCF, DRY                                       .974      .976      .977             .975      .977      .978
       DFC, WET (DRY)                                 .960( .942)                          .964( .946)
       TOT VOL (SCM) / SAM BLR (SCM)                366.6/ 77.82                         366.6/ 77.97
       KM  (MEASURED)                                  11.93                                11.89
       FUEL CONSUMPTION L/100KM                        10.52                                 9.29

COMPOSITE RESULTS                                                                                  3-BAG      (4-BAG)
  TEST NUMBER          6105-2                                  CARBON DIOXIDE          G/KM        266.2      ( 262.5)
  BAROMETER    MM HG   741.2                                   FUEL CONSUMPTION        L/100KM      9.95      (  9.82)
  HUMIDITY     G/KG     10.7                                   HYDROCARBONS (THC)      G/KM          .12      (   .11)
  TEMPERATURE  DEG C    23.3                                   CARBON MONOXIDE         G/KM          .66      (   .64)
                                                               OXIDES OF NITROGEN      G/KM          .99      (   .98)
                                                               PARTICULATES            G/KM         .290      (  .285)
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                                    FTP   - VEHICLE EMISSIONS RESULTS -
                                            PROJECT 05-5810-001

TEST NO.   6105T1   RUN   1                VEHICLE NO.61                         TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE   11/ 9/81                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO. 1 / CVS NO.  3           DIESEL    EM-465-F
TRANSMISSION A3                            DYNO NO.      2                       ODOMETER 18562. KM(11534. MILES)

BAROMETER 749.81 MM HG(29.52 IN HG)        DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  34. PCT                 ABS. HUMIDITY  6.9 GM/KG              NOX HUMIDITY CORRECTION FACTOR   .89
BAG RESULTS
  BAG NUMBER                                    1               2               3                4
  DESCRIPTION                            COLD TRANSIENT     STABILIZED     HOT TRANSIENT     STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)           736.6 (29.0)     736.6 (29.0)    734.1 (28.9)     736.6 (29.0)
  BLOWER INLET P MM. H2O(IN. H2O)         604.5 (23.8)     604.5 (23.8)    596.9 (23.5)     602.0 (23.7)
  BLOWER INLET TEMP. DEG. C(DEG. F)        33.3 ( 92.0)     33.3 ( 92.0)    35.6 ( 96.0)     33.9 ( 93.0)
  BLOWER REVOLUTIONS                        13867.           23827.          13852.           23798.
  TOT FLOW STD. CU. METRES(SCF)          137.3 ( 4849.)   236.0 ( 8334.)  136.8 ( 4830.)   235.6 ( 8319.)
  HC  SAMPLE METER/RANGE/PPM              9.7/11/  10.     6.3/11/   6.    7.8/11/   8.     6.2/11/   6.
  HC  BCKGRD METER/RANGE/PPM              3.7/ 1/   4.     3.3/ 1/   3.    3.3/ 1/   3.     3.3/ 1/   3.
  CO  SAMPLE METER/RANGE/PPM             29.7/13/  27.    16.8/13/  15.   23.2/13/  21.    15.9/13/  14.
  CO  BCKGRD METER/RANGE/PPM              1.7/13/   2.     1.5/13/   1.     .7/13/   1.      .6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT             44.5/ 3/  .76    24.1/ 3/  .39   37.1/ 3/  .62    23.7/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT              2.6/ 3/  .04     2.7/ 3/  .04    2.2/ 3/  .03     2.4/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM             25.9/ 2/  26.    14.0/ 2/  14.   24.2/ 2/  24.    14.0/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM               .2/ 2/   0.      .1/ 2/   0.     .4/ 2/   0.      .4/ 2/   0.
  DILUTION FACTOR                            17.50            34.00           21.37            34.62
  HC  CONCENTRATION PPM                      6.               3.              5.               3.
  CO  CONCENTRATION PPM                     25.              14.             20.              14.
  CO2 CONCENTRATION PCT                       .72              .35             .59              .35
  NOX CONCENTRATION PPM                     25.7             13.9            23.8             13.6
  FILTER WT. MG (EFFICIENCY, %)          .190 (76.)       .184 (72.)      .208 (73.)       .179 (75.)
  HC  MASS GRAMS                              .49              .43             .37              .41
  CO  MASS GRAMS                             4.02             3.76            3.20             3.74
  CO2 MASS GRAMS                           1822.0           1520.6          1483.0           1507.4
  NOX MASS GRAMS                             6.01             5.58            5.54             5.45
  PARTICULATE MASS GRAMS                      .15              .15             .17              .15

  HC  GRAMS/KM                                .08              .07             .06              .07
  CO  GRAMS/KM                                .70              .60             .56              .61
  CO2 GRAMS/KM                              314.8            243.8           258.4            244.8
  NOX GRAMS/KM                               1.04              .89             .97              .89
  FUEL CONSUMPTION BY CB L/100KM            11.76             9.11            9.65             9.15

  RUN TIME               SECONDS            505.             869.            505.             868.
  MEASURED DISTANCE      KM                 5.79             6.24            5.74             6.16
  SCF, DRY                                  .982     .984    .986            .983     .985    .986
       DFC, WET (DRY)                           .960( .950)                      .965( .954)
       TOT VOL (SCM) / SAM BLR (SCM)          373.4/ 79.70                     372.4/ 79.86
       KM  (MEASURED)                              12.03                            11.90
       FUEL CONSUMPTION L/100KM                    10.39                             9.39

COMPOSITE RESULTS                                                                       3-BAG        (4-BAG)
  TEST NUMBER          6105T1                          CARBON DIOXIDE       G/KM        262.5      ( 262.8)
  BAROMETER    MM HG  749.8                            FUEL CONSUMPTION     L/100KM      9.81      (  9.82)
  HUMIDITY     G/KG     6.9                            HYDROCARBONS (THC)   G/KM          .07      (   .07)
  TEMPERATURE  DEG C   25.6                            CARBON MONOXIDE      G/KM          .61      (   .61)
                                                       OXIDES OF NITROGEN   G/KM          .94      (   .94)
                                                       PARTICULATES         G/KM         .026      (  .026)
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                                  FTP   - VEHICLE EMISSIONS RESULTS -
                                            PROJECT 05-5810-001

TEST NO.   6105T2   RUN   1
VEHICLE MODEL   80 MERCEDES 300D          VEHICLE NO.61
ENGINE 3.0 L(183. CID) L-5                DATE    11/10/81                       TEST WEIGHT  1814. KG( 4000. LBS)
TRANSMISSION A3                           BAG CART NO. 1 / CVS NO.  3            ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
                                          DYNO NO.      2                        DIESEL     EM-465-F
BAROMETER 751.84 MM HG(29.60 IN HG)                                              ODOMETER 18593. KM(11553. MILES)
RELATIVE HUMIDITY  24. PCT                DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
BAG RESULTS                               ABS. HUMIDITY  5.2 GM/KG
   BAG NUMBER                                                                    NOX HUMIDITY CORRECTION FACTOR   .85
   DESCRIPTION                                 1                 2                  3                  4
                                          COLD TRANSIENT     STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H20(IN. H20)          736.6 (29.0)      736.6 (29.0)       736.6 (29.0)       736.6 (29.0)
   BLOWER INLET P MM. H20(IN. H20)        604.5 (23.8)      604.5 (23.8)       604.5 (23.8)       604.5 (23.8)
   BLOWER INLET TEMP. DEG. C(DEG. F)       33.9 ( 93.0)      32.2 ( 90.0)       35.6 ( 96.0)       33.9 ( 93.0)
   BLOWER REVOLUTIONS                        13836.            23926.             13846.             23818.
   TOT FLOW STD. CU. METRES(SCF)          137.6 ( 4860.)    238.9 ( 8435.)     137.2 ( 4845.)     236.7 ( 8360.)
   HC  SAMPLE METER/RANGE/PPM             10.7/11/  11.      6.8/11/   7.       9.0/11/   9.       6.6/11/   7.
   HC  BCKGRD METER/RANGE/PPM              5.6/ 1/   6.      4.1/ 1/   4.       4.1/ 1/   4.       3.6/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM             31.3/13/  29.     19.6/13/  18.      26.7/13/  24.      17.3/13/  16.
   CO  BCKGRD METER/RANGE/PPM              6.6/13/   6.      5.2/13/   5.       2.6/13/   2.       2.1/13/   2.
   CO2 SAMPLE METER/RANGE/PCT             41.0/ 3/  .70     23.3/ 3/  .38      38.1/ 3/  .64      24.0/ 3/  .39
   CO2 BCKGRD METER/RANGE/PCT              2.9/ 3/  .04      2.5/ 3/  .04       2.3/ 3/  .04       2.6/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM             24.3/ 2/  24.     14.4/ 2/  14.      25.3/ 2/  25.      14.3/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM              1.0/ 2/   1.       .5/ 2/   1.        .3/ 2/   0.        .3/ 2/   0.
   DILUTION FACTOR                          19.14             35.21              20.75              34.15
   HC   CONCENTRATION PPM                    5.                3.                 5.                 3.
   CO   CONCENTRATION PPM                   23.               13.                22.                14.
   CO2  CONCENTRATION PCT                   .65               .34                .61                .35
   NOX  CONCENTRATION PPM                   23.4              13.9               25.0               14.0
   FILTER WT. MG (EFFICIENCY, %)          .242 (81.)        .219 (78.)         .283 (79.)         .221 (80.)
   HC   MASS GRAMS                           .42               .39                .40                .42
   CO   MASS GRAMS                          3.62              3.63               3.48               3.76
   CO2  MASS GRAMS                        1648.7            1491.4             1530.3             1524.2
   NOX  MASS GRAMS                          5.20              5.38               5.55               5.37
   PARTICULATE MASS GRAMS                    .18               .17                .23                .17

   HC   GRAMS/KM                             .07               .06                .07                .07
   CO   GRAMS/KM                             .62               .58                .60                .61
   CO2  GRAMS/KM                           283.9             239.0              264.9              245.4
   NOX  GRAMS/KM                             .90               .86                .96                .86
   FUEL CONSUMPTION BY CB L/100KM          10.60              8.93               9.90               9.17

   RUN TIME               SECONDS          504.              873.               505.               869.
   MEASURED DISTANCE      KM               5.81              6.24               5.78               6.21
   SCF, DRY                                .986              .989               .986               .989
        DFC, WET (DRY)                                .988                                 .988
        TOT VOL (SCM) / SAM BLR (SCM)            .963( .956)                         .964( .956)
        KM  (MEASURED)                          376.5/ 81.66                        374.0/ 81.46
        FUEL CONSUMPTION L/100KM                   12.05                               11.99
                                                    9.74                                9.52
COMPOSITE RESULTS
   TEST NUMBER              6105T2
   BAROMETER      MM HG      751.8                                                   3-BAG       (4-BAG)
   HUMIDITY       G/KG         5.2         CARBON DIOXIDE          G/KM              255.4      ( 257.3)
   TEMPERATURE    DEG C       26.7         FUEL CONSUMPTION        L/100KM             9.54     (   9.61)
                                           HYDROCARBONS (THC)      G/KM                 .07     (    .07)
                                           CARBON MONOXIDE         G/KM                 .60     (    .60)
                                           OXIDES OF NITROGEN      G/KM                 .90     (    .90)
                                           PARTICULATES            G/KM                .032     (   .032)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -16000 WITH OUT TRAP
                                                PROJECT 05-5810-001

TEST NO.   6110-1   RUN   1                     VEHICLE NO.61                            TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                DATE   12/22/81                          ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                      BAG CART NO. 1 / CVS NO.  3              DIESEL     EM-465-F
TRANSMISSION A3                                 DYNO NO.      2                          ODOMETER 27264. KM(16941. MILES)

BAROMETER 730.25 MM HG(28.75 IN HG)             DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
RELATIVE HUMIDITY  62. PCT                      ABS. HUMIDITY 11.6 GM/KG                 NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
  BAG NUMBER                                          1                  2                   3                   4
  DESCRIPTION                                  COLD TRANSIENT        STABILIZED        HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                711.2 (28.0)        711.2 (28.0)        711.2 (28.0)        711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)              584.2 (23.0)        584.2 (23.0)        584.2 (23.0)        584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)             36.1 ( 97.0)        34.4 ( 94.0)        35.0 ( 95.0)        34.4 ( 94.0)
  BLOWER REVOLUTIONS                              13874.              23828.              13832.              23832.
  TOT FLOW STD. CU. METRES(SCF)                132.5 ( 4679.)      228.2 ( 8058.)      132.4 ( 4675.)      228.2 ( 8059.)
  HC   SAMPLE METER/RANGE/PPM                  20.4/11/  20.       14.3/11/  14.       15.0/11/  15.       12.7/11/  13.
  HC   BCKGRD METER/RANGE/PPM                   5.5/ 1/   6.        8.5/ 1/   9.        8.5/ 1/   9.        8.5/ 1/   9.
  CO   SAMPLE METER/RANGE/PPM                  39.4/13/  37.       24.8/13/  23.       28.7/13/  26.       21.1/13/  19.
  CO   BCKGRD METER/RANGE/PPM                  11.7/13/  11.        9.7/13/   9.        6.9/13/   6.        5.5/13/   5.
  CO2  SAMPLE METER/RANGE/PCT                  44.4/ 3/  .76       25.1/ 3/  .41       35.8/ 3/  .60       24.2/ 3/  .39
  CO2  BCKGRD METER/RANGE/PCT                   3.1/ 3/  .05        2.7/ 3/  .04        2.7/ 3/  .04        2.5/ 3/  .04
  NOX  SAMPLE METER/RANGE/PPM                  24.3/ 2/  24.       14.5/ 2/  15.       22.0/ 2/  22.       13.6/ 2/  14.
  NOX  BCKGRD METER/RANGE/PPM                   1.1/ 2/   1.        1.0/ 2/   1.         .8/ 2/   1.         .6/ 2/   1.
  DILUTION FACTOR                                   17.50               32.45               22.17               33.77
  HC   CONCENTRATION PPM                            15.                  6.                  7.                  4.
  CO   CONCENTRATION PPM                            26.                 14.                 20.                 14.
  CO2  CONCENTRATION PCT                            .72                 .37                 .56                 .36
  NOX  CONCENTRATION PPM                            23.3                13.5                21.2                13.0
  FILTER WT. MG (EFFICIENCY, %)                3.012 (99.)         2.481 (98.)         2.610 (99.)         2.471 (98.)
  HC   MASS GRAMS                                   1.16                 .80                 .52                 .58
  CO   MASS GRAMS                                   3.95                3.64                3.03                3.71
  CO2  MASS GRAMS                                 1735.7              1543.1              1359.7              1490.1
  NOX  MASS GRAMS                                   6.08                6.09                5.54                5.86
  PARTICULATE MASS GRAMS                            1.81                1.51                1.58                1.52

  HC   GRAMS/KM                                     .20                 .13                 .09                 .09
  CO   GRAMS/KM                                     .68                 .58                 .53                 .60
  CO2  GRAMS/KM                                   298.9               246.5               236.6               240.9
  NOX  GRAMS/KM                                    1.05                 .97                 .96                 .95
  FUEL CONSUMPTION BY CB L/100KM                  11.18                9.22                8.84                9.01

  RUN TIME                  SECONDS               505.                868.                505.                868.
  MEASURED DISTANCE         KM                    5.81                6.26                5.75                6.19
  SCF, DRY                                        .973       .975     .976                .974       .976     .976
       DFC, WET (DRY)                                   .960( .940)                             .965( .945)
       TOT VOL (SCM) / SAM BLR (SCM)                   360.7/ 75.77                            360.6/ 75.73
       KM  (MEASURED)                                     12.07                                   11.93
       FUEL CONSUMPTION L/100KM                           10.16                                    8.93

COMPOSITE RESULTS
  TEST NUMBER              6110-1                                                                 3-BAG       (4-BAG)
  BAROMETER     MM HG   730.3                          CARBON DIOXIDE          G/KM              254.6      ( 253.0)
  HUMIDITY      G/KG      11.6                         FUEL CONSUMPTION        L/100KM             9.52      (  9.46)
  TEMPERATURE   DEG C     23.3                         HYDROCARBONS (THC)      G/KM                 .13      (   .12)
                                                       CARBON MONOXIDE         G/KM                 .59      (   .59)
                                                       OXIDES OF NITROGEN      G/KM                 .99      (   .98)
                                                       PARTICULATES            G/KM                .265      (  .267)
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                                       FTP   - VEHICLE EMISSIONS RESULTS -16000, WIT OUT TRAP
                                                PROJECT 05-5810-001
TEST NO.   6110-2   RUN   1
VEHICLE MODEL   80 MERCEDES 300D           VEHICLE NO.61
ENGINE 3.0 L(183. CID) L-5                 DATE    12/23/81                    TEST WEIGHT  1814. KG( 4000. LBS)
TRANSMISSION A3                            BAG CART NO. 1 / CVS NO.  3         ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
                                           DYNO NO.      2                     DIESEL    EM-465-F
                                                                               ODOMETER 27291. KM(16958. MILES)
BAROMETER 743.46 MM HG(29.27 IN HG)
RELATIVE HUMIDITY  23. PCT                 DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
BAG RESULTS                                ABS. HUMIDITY  4.0 GM/KG            NOX HUMIDITY CORRECTION FACTOR   .82
  BAG NUMBER                                     1                2                  3                4
  DESCRIPTION                              COLD TRANSIENT     STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)     711.2 (28.0)      711.2 (28.0)      711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)           584.2 (23.0)     584.2 (23.0)      584.2 (23.0)      584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          33.9 ( 93.0)     32.2 ( 90.0)      34.4 ( 94.0)      32.2 ( 90.0)
  BLOWER REVOLUTIONS                          13859.           23820.            13848.            23826.
  TOT FLOW STD. CU. METRES(SCF)             135.9 ( 4800.)   234.5 ( 8281.)    135.7 ( 4791.)    234.5 ( 8281.)
  HC  SAMPLE METER/RANGE/PPM                15.6/11/  16.    10.6/11/  11.     10.4/11/  10.      8.3/11/   8.
  HC  BCKGRD METER/RANGE/PPM                 8.5/ 1/   9.     5.5/ 1/   6.      5.5/ 1/   6.      5.0/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                31.1/13/  29.    18.5/13/  17.     24.6/13/  22.     16.9/13/  15.
  CO  BCKGRD METER/RANGE/PPM                 3.8/13/   3.     3.1/13/   3.      2.2/13/   2.      1.8/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                43.2/ 3/  .74    24.6/ 3/  .40     36.9/ 3/  .62     23.7/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04     2.8/ 3/  .04      3.1/ 3/  .05      2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                25.0/ 2/  25.    14.5/ 2/  15.     23.1/ 2/  23.     14.1/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                  .7/ 2/   1.      .5/ 2/   1.       .4/ 2/   0.       .5/ 2/   1.
  DILUTION FACTOR                              18.06            33.22             21.48             34.59
  HC  CONCENTRATION PPM                         8.               5.                5.                3.
  CO  CONCENTRATION PPM                        25.              14.               20.               14.
  CO2 CONCENTRATION PCT                         .70              .36               .58               .35
  NOX CONCENTRATION PPM                        24.3             14.0              22.7              13.6
  FILTER WT. MG (EFFICIENCY, %)             2.886 (99.)      2.533 (99.)       2.864 (99.)       2.549 (99.)
  HC  MASS GRAMS                                .59              .71               .40               .47
  CO  MASS GRAMS                               3.92             3.79              3.19              3.70
  CO2 MASS GRAMS                             1731.5           1541.9            1428.9            1494.1
  NOX MASS GRAMS                               5.19             5.15              4.83              5.01
  PARTICULATE MASS GRAMS                       1.79             1.58              1.79              1.60

  HC  GRAMS/KM                                  .10              .11               .07               .08
  CO  GRAMS/KM                                  .67              .61               .55               .59
  CO2 GRAMS/KM                                296.9            247.2             246.6             239.2
  NOX GRAMS/KM                                  .89              .83               .83               .80
  FUEL CONSUMPTION BY CB L/100KM              11.09             9.25              9.21              8.94

  RUN TIME                SECONDS             505.             868.              504.              868.
  MEASURED DISTANCE       KM                  5.83             6.24              5.79              6.25
  SCF, DRY                                    .986    .988     .989              .987     .988     .989
      DFC, WET (DRY)                               .961( .953)                         .965( .957)
      TOT VOL (SCM) / SAM BLR (SCM)              370.5/ 78.57                        370.2/ 78.55
      KM  (MEASURED)                                12.07                               12.04
      FUEL CONSUMPTION L/100KM                      10.14                                9.07

COMPOSITE RESULTS
  TEST NUMBER            6110-2                                                   3-BAG       (4-BAG)
  BAROMETER     MM HG     743.5            CARBON DIOXIDE          G/KM           257.4      ( 255.0)
  HUMIDITY      G/KG        4.0            FUEL CONSUMPTION        L/100KM          9.62     (   9.53)
  TEMPERATURE   DEG C      22.8            HYDROCARBONS (THC)      G/KM              .10     (    .09)
                                           CARBON MONOXIDE         G/KM              .61     (    .60)
                                           OXIDES OF NITROGEN      G/KM              .84     (    .83)
                                           PARTICULATES            G/KM             .280     (   .281)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -16000 KM WITH TRAP
                                                PROJECT 05-5810-001

TEST NO.   6110T1   RUN   1                VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE   12/18/81                        ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-465-F
TRANSMISSION A3                            DYNO NO.      2                        ODOMETER 27040. KM(16802. MILES)

BAROMETER 754.38 MM HG(29.70 IN HG)        DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
RELATIVE HUMIDITY  15. PCT                 ABS. HUMIDITY  2.6 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .79
BAG RESULTS
   BAG NUMBER                                   1                   2                   3                   4
   DESCRIPTION                            COLD TRANSIENT        STABILIZED         HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           716.3 (28.2)        716.3 (28.2)        716.3 (28.2)        716.3 (28.2)
   BLOWER INLET P MM. H2O(IN. H2O)         589.3 (23.2)        589.3 (23.2)        589.3 (23.2)        589.3 (23.2)
   BLOWER INLET TEMP. DEG. C(DEG. F)        30.6 ( 87.0)        31.1 ( 88.0)        34.4 ( 94.0)        32.2 ( 90.0)
   BLOWER REVOLUTIONS                        13819.              23806.              13834.              23813.
   TOT FLOW STD. CU. METRES(SCF)           138.7 ( 4899.)      238.7 ( 8428.)      137.7 ( 4861.)      238.1 ( 8407.)
   HC   SAMPLE METER/RANGE/PPM             11.4/11/  11.        7.2/11/   7.        8.8/11/   9.        7.1/11/   7.
   HC   BCKGRD METER/RANGE/PPM              5.1/ 1/   5.        4.7/ 1/   5.        4.7/ 1/   5.        4.3/ 1/   4.
   CO   SAMPLE METER/RANGE/PPM             34.5/13/  32.       21.1/13/  19.       26.5/13/  24.       19.0/13/  17.
   CO   BCKGRD METER/RANGE/PPM              8.2/13/   7.        6.8/13/   6.        5.2/13/   5.        4.9/13/   4.
   CO2  SAMPLE METER/RANGE/PCT             43.3/ 3/  .74       24.0/ 3/  .39       37.1/ 3/  .62       23.2/ 3/  .38
   CO2  BCKGRD METER/RANGE/PCT              3.1/ 3/  .05        3.1/ 3/  .05        2.9/ 3/  .04        1.9/ 3/  .03
   NOX  SAMPLE METER/RANGE/PPM             24.6/ 2/  25.       14.0/ 2/  14.       24.0/ 2/  24.       14.1/ 2/  14.
   NOX  BCKGRD METER/RANGE/PPM               .4/ 2/   0.         .2/ 2/   0.         .1/ 2/   0.         .2/ 2/   0.
   DILUTION FACTOR                            18.02               34.11               21.36               35.37
   HC   CONCENTRATION PPM                      7.                  3.                  4.                  3.
   CO   CONCENTRATION PPM                     24.                 13.                 19.                 13.
   CO2  CONCENTRATION PCT                      .69                 .34                 .58                 .35
   NOX  CONCENTRATION PPM                     24.2                13.8                23.9                13.9
   FILTER WT. MG (EFFICIENCY, %)           .166 (85.)          .139 (74.)          .208 (88.)          .140 (80.)
   HC   MASS GRAMS                             .52                 .37                 .34                 .40
   CO   MASS GRAMS                            3.93                3.63                3.11                3.55
   CO2  MASS GRAMS                          1764.5              1504.0              1466.7              1517.9
   NOX  MASS GRAMS                            5.07                4.97                4.97                5.00
   PARTICULATE MASS GRAMS                      .12                 .12                 .15                 .11

   HC   GRAMS/KM                               .09                 .06                 .06                 .06
   CO   GRAMS/KM                               .67                 .57                 .53                 .57
   CO2  GRAMS/KM                             300.1               238.0               251.3               242.1
   NOX  GRAMS/KM                               .86                 .79                 .85                 .80
   FUEL CONSUMPTION BY CB L/100KM            11.21                8.89                9.38                9.05

   RUN TIME               SECONDS            504.                868.                504.                868.
   MEASURED DISTANCE      KM                 5.88                6.32                5.84                6.27
   SCF, DRY                                  .988                .992                .990                .992
        DFC, WET (DRY)                                 .990                                    .991
        TOT VOL (SCM) / SAM BLR (SCM)               .961( .957)                             .965( .960)
        KM  (MEASURED)                            377.4/ 80.86                            375.8/ 80.87
        FUEL CONSUMPTION L/100KM                      12.20                                   12.11
                                                      10.01                                    9.21
COMPOSITE RESULTS
   TEST NUMBER              6110T1                                                    3-BAG       (4-BAG)
   BAROMETER       MM HG    754.4                    CARBON DIOXIDE        G/KM       254.5      ( 255.8)
   HUMIDITY        G/KG       2.6                    FUEL CONSUMPTION      L/100KM      9.51      (   9.55)
   TEMPERATURE     DEG C     23.3                    HYDROCARBONS (THC)    G/KM         .06      (    .07)
                                                     CARBON MONOXIDE       G/KM         .58      (    .58)
                                                     OXIDES OF NITROGEN    G/KM         .82      (    .82)
                                                     PARTICULATES          G/KM        .021      (   .021)
                                        FTP   - VEHICLE EMISSIONS RESULTS -16000 KM WITH TRAP
                                                 PROJECT 05-5810-001

TEST NO.   6110T2   RUN   1                 VEHICLE NO.61                             TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D            DATE   12/21/81                           ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                  BAG CART NO. 1 / CVS NO.  3               DIESEL     EM-465-F
TRANSMISSION A3                             DYNO NO.       2                          ODOMETER 27092. KM(16834. MILES)

BAROMETER 735.08 MM HG(28.94 IN HG)         DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  53. PCT                  ABS. HUMIDITY 11.3 GM/KG                  NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
  BAG NUMBER                                      1                  2                  3                  4
  DESCRIPTION                              COLD TRANSIENT       STABILIZED        HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)            711.2 (28.0)       711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)          581.7 (22.9)       581.7 (22.9)       584.2 (23.0)       584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)         35.6 ( 96.0)       35.0 ( 95.0)       35.0 ( 95.0)       33.9 ( 93.0)
  BLOWER REVOLUTIONS                         13877.             23816.             13868.             23824.
  TOT FLOW STD. CU. METRES(SCF)            134.0 ( 4733.)     230.3 ( 8132.)     134.1 ( 4734.)     230.8 ( 8149.)
  HC  SAMPLE METER/RANGE/PPM               16.7/11/  17.       9.5/11/   9.      11.7/11/  12.       9.2/11/   9.
  HC  BCKGRD METER/RANGE/PPM                6.0/ 1/   6.       5.5/ 1/   6.       5.5/ 1/   6.       6.5/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM               31.0/13/  29.      17.1/13/  16.      25.4/13/  23.      17.3/13/  16.
  CO  BCKGRD METER/RANGE/PPM                1.4/13/   1.       1.5/13/   1.       1.4/13/   1.       1.4/13/   1.
  CO2 SAMPLE METER/RANGE/PCT               43.6/ 3/  .75      25.0/ 3/  .41      37.6/ 3/  .63      23.9/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                2.9/ 3/  .04       2.6/ 3/  .04       2.8/ 3/  .04       2.6/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM               22.0/ 2/  22.      13.1/ 2/  13.      20.9/ 2/  21.      12.3/ 2/  12.
  NOX BCKGRD METER/RANGE/PPM                 .3/ 2/   0.        .2/ 2/   0.        .1/ 2/   0.        .1/ 2/   0.
  DILUTION FACTOR                              17.88              32.68              21.04              34.28
  HC   CONCENTRATION PPM                       11.                 4.                 6.                 3.
  CO   CONCENTRATION PPM                       26.                14.                21.                14.
  CO2  CONCENTRATION PCT                        .70                .37                .59                .35
  NOX  CONCENTRATION PPM                       21.7               12.9               20.8               12.2
  FILTER WT. MG (EFFICIENCY, %)            .354 (84.)         .250 (81.)         .318 (85.)         .213 (81.)
  HC   MASS GRAMS                               .85                .55                .50                .38
  CO   MASS GRAMS                              4.13               3.71               3.34               3.79
  CO2  MASS GRAMS                            1725.8             1556.1             1454.3             1478.6
  NOX  MASS GRAMS                              5.68               5.80               5.44               5.49
  PARTICULATE MASS GRAMS                        .26                .19                .23                .16

  HC   GRAMS/KM                                 .15                .09                .09                .06
  CO   GRAMS/KM                                 .71                .60                .57                .61
  CO2  GRAMS/KM                               296.6              249.5              250.6              238.1
  NOX  GRAMS/KM                                 .98                .93                .94                .88
  FUEL CONSUMPTION BY CB L/100KM              11.09               9.32               9.36               8.90

  RUN TIME              SECONDS                505.               868.               505.               868.
  MEASURED DISTANCE     KM                     5.82               6.24               5.80               6.21
  SCF, DRY                                     .976      .978      .979              .977      .978      .979
       DFC, WET (DRY)                              .960( .944)                           .964( .948)
       TOT VOL (SCM) / SAM BLR (SCM)              364.3/ 77.42                          364.8/ 77.35
       KM  (MEASURED)                                 12.06                                 12.01
       FUEL CONSUMPTION L/100KM                       10.18                                  9.12

COMPOSITE RESULTS
  TEST NUMBER             6110T2                                                          3-BAG       (4-BAG)
  BAROMETER     MM HG    735.1                   CARBON DIOXIDE          G/KM            259.5      ( 256.2)
                                                 FUEL CONSUMPTION        L/100KM           9.70     (   9.58)
  HUMIDITY      G/KG      11.3                   HYDROCARBONS (THC)      G/KM               .10     (    .09)
  TEMPERATURE   DEG C     25.6                   CARBON MONOXIDE         G/KM               .61     (    .62)
                                                 OXIDES OF NITROGEN      G/KM               .94     (    .93)
                                                 PARTICULATES            G/KM              .036     (   .034)
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                                      FTP   - VEHICLE EMISSIONS RESULTS -24000 KM W/O TRAP
                                               PROJECT 05-5810-001

TEST NO.   6115-1   RUN   1                 VEHICLE NO.61                            TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D            DATE     1/20/82                         ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                  BAG CART NO. 1 / CVS NO.  3              DIESEL     EM-465-F
TRANSMISSION A3                             DYNO NO.        2                        ODOMETER 35666. KM(22162. MILES)

BAROMETER 735.84 MM HG(28.97 IN HG)         DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)
RELATIVE HUMIDITY  52. PCT                  ABS. HUMIDITY 12.1 GM/KG                 NOX HUMIDITY CORRECTION FACTOR  1.05
BAG RESULTS
   BAG NUMBER                                       1                  2                   3                   4
   DESCRIPTION                               COLD TRANSIENT       STABILIZED          HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)        711.2 (28.0)        711.2 (28.0)        711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)            584.2 (23.0)        584.2 (23.0)        584.2 (23.0)        584.2 (23.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)        36.7 ( 98.0)        36.7 ( 98.0)        37.2 ( 99.0)
   BLOWER REVOLUTIONS                            13831.              23795.              13845.              23700.
   TOT FLOW STD. CU. METRES(SCF)              133.3 ( 4706.)      229.1 ( 8089.)      133.3 ( 4706.)      228.1 ( 8055.)
   HC  SAMPLE METER/RANGE/PPM                 16.7/11/  17.       11.1/11/  11.       11.7/11/  12.       10.9/11/  11.
   HC  BCKGRD METER/RANGE/PPM                  8.3/ 1/   8.        7.2/ 1/   7.        7.2/ 1/   7.        9.0/ 1/   9.
   CO  SAMPLE METER/RANGE/PPM                 28.8/13/  26.       17.5/13/  16.       23.9/13/  22.       18.1/13/  16.
   CO  BCKGRD METER/RANGE/PPM                  1.5/13/   1.        1.5/13/   1.        2.0/13/   2.        1.7/13/   2.
   CO2 SAMPLE METER/RANGE/PCT                 44.3/ 3/  .76       25.2/ 3/  .41       36.4/ 3/  .61       24.3/ 3/  .40
   CO2 BCKGRD METER/RANGE/PCT                  2.7/ 3/  .04        2.8/ 3/  .04        2.6/ 3/  .04        2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                 23.4/ 2/  23.       13.7/ 2/  14.       21.6/ 2/  22.       13.4/ 2/  13.
   NOX BCKGRD METER/RANGE/PPM                   .4/ 2/   0.         .4/ 2/   0.         .4/ 2/   0.         .4/ 2/   0.
   DILUTION FACTOR                               17.57               32.39               21.80               33.66
   HC   CONCENTRATION PPM                         9.                  4.                  5.                  2.
   CO   CONCENTRATION PPM                        24.                 14.                 20.                 15.
   CO2  CONCENTRATION PCT                        .72                 .37                 .57                 .36
   NOX  CONCENTRATION PPM                       23.0                13.3                21.2                13.0
   FILTER WT. MG (EFFICIENCY, %)             2.937 (98.)         2.417 (98.)         2.532 (98.)         2.350 (98.)
   HC   MASS GRAMS                               .68                 .55                 .37                 .28
   CO   MASS GRAMS                              3.78                3.79                3.03                3.87
   CO2  MASS GRAMS                            1755.2              1550.1              1399.1              1496.7
   NOX  MASS GRAMS                              6.14                6.11                5.66                5.94
   PARTICULATE MASS GRAMS                       1.81                1.49                1.56                1.46

   HC   GRAMS/KM                                 .12                 .09                 .06                 .04
   CO   GRAMS/KM                                 .64                 .59                 .51                 .61
   CO2  GRAMS/KM                               299.5               242.7               237.6               235.8
   NOX  GRAMS/KM                                1.05                 .96                 .96                 .94
   FUEL CONSUMPTION BY CB L/100KM              11.19                9.07                8.87                8.81

   RUN TIME                SECONDS              504.                867.                505.                867.
   MEASURED DISTANCE       KM                   5.86                6.39                5.89                6.35
   SCF, DRY                                     .976      .978      .980                .978      .979      .980
        DFC, WET (DRY)                               .960( .944)                             .964( .948)
        TOT VOL (SCM) / SAM BLR (SCM)               362.3/ 76.50                            361.4/ 76.45
        KM  (MEASURED)                                 12.25                                   12.24
        FUEL CONSUMPTION L/100KM                       10.09                                    8.84

COMPOSITE RESULTS
   TEST NUMBER               6115-1                                                         3-BAG      (4-BAG)
   BAROMETER     MM HG       735.8                 CARBON DIOXIDE         G/KM              253.0     ( 251.0)
   HUMIDITY      G/KG         12.1                 FUEL CONSUMPTION       L/100KM            9.46     (   9.38)
   TEMPERATURE   DEG C        27.2                 HYDROCARBONS (THC)     G/KM                .09     (    .07)
                                                   CARBON MONOXIDE        G/KM                .58     (    .59)
                                                   OXIDES OF NITROGEN     G/KM                .98     (    .97)
                                                   PARTICULATES           G/KM               .258     (   .257)
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                                         FTP   - VEHICLE EMISSIONS RESULTS -24000 KM W/O TRAP
                                                 PROJECT 05-5810-001

TEST NO.   6115-2   RUN   1                  VEHICLE NO.61                      TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE     1/21/82                   ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3        DIESEL    EM-465-F
TRANSMISSION A3                              DYNO NO.      2                    ODOMETER 35697. KM(22181. MILES)

BAROMETER 738.12 MM HG(29.06 IN HG)          DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  57. PCT                   ABS. HUMIDITY 12.0 GM/KG           NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
  BAG NUMBER                                       1              2               3              4
  DESCRIPTION                                COLD TRANSIENT   STABILIZED      HOT TRANSIENT    STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)     711.2 (28.0)    711.2 (28.0)     711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)            584.2 (23.0)     584.2 (23.0)    584.2 (23.0)     584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)     36.1 ( 97.0)    36.1 ( 97.0)     36.1 ( 97.0)
  BLOWER REVOLUTIONS                           13827.           23801.          13849.           23800.
  TOT FLOW STD. CU. METRES(SCF)              133.7 ( 4720.)   230.1 ( 8125.)  133.9 ( 4728.)   230.1 ( 8125.)
  HC  SAMPLE METER/RANGE/PPM                 14.9/11/  15.    11.5/11/  12.   12.6/11/  13.    11.4/11/  11.
  HC  BCKGRD METER/RANGE/PPM                  8.0/ 1/   8.     7.5/ 1/   8.    7.5/ 1/   8.     8.0/ 1/   8.
  CO  SAMPLE METER/RANGE/PPM                 32.0/13/  29.    21.5/13/  20.   27.3/13/  25.    19.3/13/  18.
  CO  BCKGRD METER/RANGE/PPM                  4.8/13/   4.     5.4/13/   5.    4.9/13/   4.     3.8/13/   3.
  CO2 SAMPLE METER/RANGE/PCT                 44.6/ 3/  .76    25.6/ 3/  .42   38.9/ 3/  .66    24.5/ 3/  .40
  CO2 BCKGRD METER/RANGE/PCT                  3.1/ 3/  .05     3.3/ 3/  .05    3.4/ 3/  .05     2.9/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                 22.3/ 2/  22.    13.0/ 2/  13.   21.3/ 2/  21.    12.6/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                   .6/ 2/   1.      .6/ 2/   1.     .5/ 2/   1.      .7/ 2/   1.
  DILUTION FACTOR                                17.44            31.82           20.27            33.35
  HC  CONCENTRATION PPM                           7.               4.              5.               4.
  CO  CONCENTRATION PPM                          25.              14.             20.              14.
  CO2 CONCENTRATION PCT                           .72              .37             .61              .36
  NOX CONCENTRATION PPM                          21.7             12.4            20.8             11.9
  FILTER WT. MG (EFFICIENCY, %)               2.784 (99.)      2.505 (98.)     2.625 (99.)      2.407 (98.)
  HC  MASS GRAMS                                  .56              .57             .42              .48
  CO  MASS GRAMS                                 3.81             3.87            3.14             3.71
  CO2 MASS GRAMS                               1760.4           1555.0          1490.0           1499.2
  NOX MASS GRAMS                                 5.80             5.70            5.57             5.48
  PARTICULATE MASS GRAMS                         1.72             1.55            1.63             1.54

  HC  GRAMS/KM                                    .10              .09             .07              .08
  CO  GRAMS/KM                                    .66              .63             .54              .59
  CO2 GRAMS/KM                                  305.5            251.5           255.7            240.2
  NOX GRAMS/KM                                   1.01              .92             .96              .88
  FUEL CONSUMPTION BY CB L/100KM                11.41             9.40            9.55             8.98

  RUN TIME              SECONDS                 504.             868.            505.             867.
  MEASURED DISTANCE     KM                      5.76             6.18            5.83             6.24
  SCF, DRY                                      .975      .977   .978            .976      .977   .978
       DFC, WET (DRY)                                 .959( .942)                      .963( .945)
       TOT VOL (SCM) / SAM BLR (SCM)                363.8/ 76.81                     364.0/ 76.83
       KM  (MEASURED)                                  11.94                            12.07
       FUEL CONSUMPTION L/100KM                        10.37                             9.25

COMPOSITE RESULTS                                                                   3-BAG     (4-BAG)
  TEST NUMBER          6115-2                         CARBON DIOXIDE       G/KM      263.9     ( 260.5)
  BAROMETER    MM HG   738.1                          FUEL CONSUMPTION     L/100KM     9.86     (  9.74)
  HUMIDITY     G/KG     12.0                          HYDROCARBONS (THC)   G/KM        .09     (   .08)
  TEMPERATURE  DEG C    25.6                          CARBON MONOXIDE      G/KM        .61     (   .60)
                                                      OXIDES OF NITROGEN   G/KM        .95     (   .94)
                                                      PARTICULATES         G/KM       .268     (  .267)
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                          FTP   - VEHICLE EMISSIONS RESULTS -24000 KM WITH TRAP
                                  PROJECT 05-5810-001

TEST NO.   6115T2   RUN   1                VEHICLE NO.61                       TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE    1/19/82                     ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO. 1 / CVS NO.  3         DIESEL    EM-465-F
TRANSMISSION A3                            DYNO NO.      2                     ODOMETER 35628. KM(22138. MILES)

BAROMETER 736.35 MM HG(28.99 IN HG)        DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
RELATIVE HUMIDITY  65. PCT                 ABS. HUMIDITY 11.8 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
  BAG NUMBER                                     1                2                3                4
  DESCRIPTION                             COLD TRANSIENT      STABILIZED     HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)            711.2 (28.0)     711.2 (28.0)     711.2 (28.0)     711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)          584.2 (23.0)     584.2 (23.0)     584.2 (23.0)     584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)         35.6 ( 96.0)     36.7 ( 98.0)     39.4 (103.0)     37.8 (100.0)
  BLOWER REVOLUTIONS                          13862.           23789.           13852.           23785.
  TOT FLOW STD. CU. METRES(SCF)            134.1 ( 4734.)   229.7 ( 8111.)   133.0 ( 4697.)   229.3 ( 8097.)
  HC  SAMPLE METER/RANGE/PPM               13.3/11/  13.     8.9/11/   9.    10.7/11/  11.     9.2/11/   9.
  HC  BCKGRD METER/RANGE/PPM                7.2/ 1/   7.     6.6/ 1/   7.     7.3/ 1/   7.     7.3/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM               30.4/13/  28.    19.4/13/  18.    24.3/13/  22.    18.1/13/  16.
  CO  BCKGRD METER/RANGE/PPM                2.6/13/   2.     2.6/13/   2.     2.1/13/   2.     2.0/13/   2.
  CO2 SAMPLE METER/RANGE/PCT               43.7/ 3/  .75    25.1/ 3/  .41    37.5/ 3/  .63    24.7/ 3/  .40
  CO2 BCKGRD METER/RANGE/PCT                3.1/ 3/  .05     3.3/ 3/  .05     2.7/ 3/  .04     3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM               22.6/ 2/  23.    12.8/ 2/  13.    22.1/ 2/  22.    13.4/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                 .3/ 2/   0.      .3/ 2/   0.      .2/ 2/   0.      .3/ 2/   0.
  DILUTION FACTOR                             17.84            32.53            21.11            33.10
  HC  CONCENTRATION PPM                        6.               2.               4.               2.
  CO  CONCENTRATION PPM                       25.              15.              20.              14.
  CO2 CONCENTRATION PCT                        .70              .36              .59              .36
  NOX CONCENTRATION PPM                      22.3             12.5             21.9             13.1
  FILTER WT. MG (EFFICIENCY, %)            .170 (79.)       .119 (66.)       .106 (70.)       .120 (71.)
  HC  MASS GRAMS                               .50              .33              .29              .28
  CO  MASS GRAMS                              3.87             3.99             3.05             3.81
  CO2 MASS GRAMS                            1723.6           1515.4           1442.1           1496.1
  NOX MASS GRAMS                              5.92             5.69             5.77             5.95
  PARTICULATE MASS GRAMS                       .13              .10              .09              .10

  HC  GRAMS/KM                                 .09              .05              .05              .05
  CO  GRAMS/KM                                 .67              .64              .52              .61
  CO2 GRAMS/KM                               297.2            242.4            247.9            239.8
  NOX GRAMS/KM                                1.02              .91              .99              .95
  FUEL CONSUMPTION BY CB L/100KM             11.10             9.06             9.26             8.96

  RUN TIME             SECONDS                505.             867.             505.             867.
  MEASURED DISTANCE    KM                     5.80             6.25             5.82             6.24
  SCF, DRY                                    .972      .974   .975             .973      .974   .975
       DFC, WET (DRY)                               .960( .940)                       .963( .943)
       TOT VOL (SCM) / SAM BLR (SCM)               363.8/ 77.31                      362.3/ 77.23
       KM  (MEASURED)                                 12.05                             12.06
       FUEL CONSUMPTION L/100KM                       10.04                              9.10

COMPOSITE RESULTS                                                                             3-BAG      (4-BAG)
  TEST NUMBER         6115T2                               CARBON DIOXIDE        G/KM       255.2     ( 254.5)
  BAROMETER   MM HG  736.3                                 FUEL CONSUMPTION      L/100KM     9.54     (  9.51)
  HUMIDITY    G/KG    11.8                                 HYDROCARBONS (THC)    G/KM         .06     (   .06)
  TEMPERATURE DEG C   22.8                                 CARBON MONOXIDE       G/KM         .61     (   .60)
                                                           OXIDES OF NITROGEN    G/KM         .96     (   .97)
                                                           PARTICULATES          G/KM        .017     (  .017)
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                                       FTP   - VEHICLE EMISSIONS RESULTS -24000 KM WITH TRAP
                                                PROJECT 05-5810-001

TEST NO.   6115T1   RUN   1                      VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                 DATE    1/18/82                        ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                       BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-465-F
TRANSMISSION A3                                  DYNO NO.      2                        ODOMETER 35472. KM(22041. MILES)

BAROMETER 737.11 MM HG(29.02 IN HG)              DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
RELATIVE HUMIDITY  41. PCT                       ABS. HUMIDITY  6.5 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .88
BAG RESULTS
  BAG NUMBER                                          1                 2                  3                  4
  DESCRIPTION                                  COLD TRANSIENT      STABILIZED        HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                 711.2 (28.0)      711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)               584.2 (23.0)      584.2 (23.0)       584.2 (23.0)       584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)              36.1 ( 97.0)      34.4 ( 94.0)       36.7 ( 98.0)       35.0 ( 95.0)
  BLOWER REVOLUTIONS                               13839.            23789.             13850.             23781.
  TOT FLOW STD. CU. METRES(SCF)                 133.6 ( 4718.)    230.4 ( 8135.)     133.6 ( 4718.)     230.0 ( 8122.)
  HC  SAMPLE METER/RANGE/PPM                    11.0/11/  11.      6.5/11/   6.       9.2/11/   9.       7.2/11/   7.
  HC  BCKGRD METER/RANGE/PPM                     5.5/ 1/   6.      5.0/ 1/   5.       5.0/ 1/   5.       4.9/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                    30.7/13/  28.     16.6/13/  15.      30.9/13/  28.      21.3/13/  19.
  CO  BCKGRD METER/RANGE/PPM                     1.2/13/   1.       .1/13/   0.       8.4/13/   8.       6.6/13/   6.
  CO2 SAMPLE METER/RANGE/PCT                    45.6/ 3/  .78     25.2/ 3/  .41      38.7/ 3/  .65      24.9/ 3/  .41
  CO2 BCKGRD METER/RANGE/PCT                     2.7/ 3/  .04      2.7/ 3/  .04       2.7/ 3/  .04       2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                    24.5/ 2/  25.     14.7/ 2/  15.      23.1/ 2/  23.      14.0/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                      .3/ 2/   0.       .3/ 2/   0.        .3/ 2/   0.        .5/ 2/   1.
  DILUTION FACTOR                                  17.03             32.43              20.39              32.81
  HC  CONCENTRATION PPM                             6.                2.                 4.                 2.
  CO  CONCENTRATION PPM                            26.               15.                21.                13.
  CO2 CONCENTRATION PCT                             .74               .37                .61                .37
  NOX CONCENTRATION PPM                            24.2              14.4               22.8               13.5
  FILTER WT. MG (EFFICIENCY, %)                 .467 (89.)        .300 (77.)         .343 (90.)         .267 (86.)
  HC  MASS GRAMS                                    .45               .22                .34                .33
  CO  MASS GRAMS                                   4.11              3.93               3.20               3.56
  CO2 MASS GRAMS                                 1820.3            1565.1             1502.9             1553.1
  NOX MASS GRAMS                                   5.44              5.58               5.13               5.23
  PARTICULATE MASS GRAMS                            .32               .24                .23                .19

  HC  GRAMS/KM                                      .08               .03                .06                .05
  CO  GRAMS/KM                                      .72               .63                .55                .57
  CO2 GRAMS/KM                                    316.5             250.5              259.6              248.7
  NOX GRAMS/KM                                      .95               .89                .89                .84
  FUEL CONSUMPTION BY CB L/100KM                  11.82              9.36               9.69               9.29

  RUN TIME              SECONDS                    504.              867.               505.               867.
  MEASURED DISTANCE     KM                         5.75              6.25               5.79               6.25
  SCF, DRY                                         .980      .982      .983               .981       .982     .983
       DFC, WET (DRY)                                     .959( .946)                             .963( .950)
       TOT VOL (SCM) / SAM BLR (SCM)                     364.0/ 77.97                            363.6/ 77.68
       KM  (MEASURED)                                        12.00                                   12.03
       FUEL CONSUMPTION L/100KM                              10.54                                    9.48

COMPOSITE RESULTS                                                                                  3-BAG       (4-BAG)
  TEST NUMBER          6115T1                              CARBON DIOXIDE        G/KM             266.6       ( 266.0)
  BAROMETER    MM HG   737.1                               FUEL CONSUMPTION      L/100KM            9.96       (  9.94)
  HUMIDITY     G/KG      6.5                               HYDROCARBONS (THC)    G/KM               .05       (   .06)
  TEMPERATURE  DEG C    21.1                               CARBON MONOXIDE       G/KM               .63       (   .61)
                                                           OXIDES OF NITROGEN    G/KM               .90       (   .89)
                                                           PARTICULATES          G/KM              .042       (  .040)
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                           FTP   - VEHICLE EMISSIONS RESULTS -32000 KM W/O TRAP
                                   PROJECT 05-5810-001

TEST NO.   6120-1   RUN   1                    VEHICLE NO.61                    TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D               DATE    2/10/82                  ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                     BAG CART NO. 1 / CVS NO.  3      DIESEL    EM-465-F
TRANSMISSION A3                                DYNO NO.      2                  ODOMETER 44160. KM(27440. MILES)

BARCMETER 748.03 MM HG(29.45 IN HG)            DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
RELATIVE HUMIDITY  19. PCT                     ABS. HUMIDITY  3.1 GM/KG         NOX HUMIDITY CORRECTION FACTOR   .80
BAG RESULTS
   BAG NUMBER                                        1               2                3                4
   DESCRIPTION                               COLD TRANSIENT     STABILIZED      HOT TRANSIENT     STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              711.2 (28.0)     711.2 (28.0)     711.2 (28.0)     711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)            584.2 (23.0)     584.2 (23.0)     584.2 (23.0)     584.2 (23.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)           28.3 ( 83.0)     32.2 ( 90.0)     31.1 ( 88.0)     32.2 ( 90.0)
   BLOWER REVOLUTIONS                          13836.           23831.           13849.           23812.
   TOT FLOW STD. CU. METRES(SCF)             138.8 ( 4901.)   236.5 ( 8350.)   137.8 ( 4865.)   236.3 ( 8344.)
   HC  SAMPLE METER/RANGE/PPM                11.9/11/  12.     8.5/11/   8.     9.0/11/   9.     8.1/11/   8.
   HC  BCKGRD METER/RANGE/PPM                 5.4/ 1/   5.     5.3/ 1/   5.     5.3/ 1/   5.     6.2/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM                27.6/13/  25.    16.7/13/  15.    21.2/13/  19.    15.8/13/  14.
   CO  BCKGRD METER/RANGE/PPM                 2.2/13/   2.     1.9/13/   2.     1.4/13/   1.     1.4/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                42.6/ 3/  .73    24.1/ 3/  .39    37.0/ 3/  .62    23.9/ 3/  .39
   CO2 BCKGRD METER/RANGE/PCT                 2.6/ 3/  .04     2.4/ 3/  .04     3.0/ 3/  .05     3.0/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                26.8/ 2/  27.    15.6/ 2/  16.    26.0/ 2/  26.    15.5/ 2/  16.
   NOX BCKGRD METER/RANGE/PPM                  .2/ 2/   0.      .2/ 2/   0.      .8/ 2/   1.      .7/ 2/   1.
   DILUTION FACTOR                              18.36            33.98            21.44            34.29
   HC  CONCENTRATION PPM                         7.               3.               4.               2.
   CO  CONCENTRATION PPM                        23.              13.              18.              13.
   CO2 CONCENTRATION PCT                         .69              .36              .58              .34
   NOX CONCENTRATION PPM                        26.6             15.4             25.2             14.8
   FILTER WT. MG (EFFICIENCY, %)             2.356 (99.)      2.198 (98.)      2.143 (99.)      2.004 (99.)
   HC  MASS GRAMS                                .54              .45              .32              .29
   CO  MASS GRAMS                               3.71             3.66             2.85             3.55
   CO2 MASS GRAMS                             1750.1           1543.0           1459.5           1487.9
   NOX MASS GRAMS                               5.65             5.58             5.32             5.36
   PARTICULATE MASS GRAMS                       1.50             1.40             1.36             1.30

   HC  GRAMS/KM                                  .09              .07              .05              .05
   CO  GRAMS/KM                                  .64              .59              .49              .57
   CO2 GRAMS/KM                                303.3            246.5            250.3            236.7
   NOX GRAMS/KM                                  .98              .89              .91              .85
   FUEL CONSUMPTION BY CB L/100KM              11.33             9.21             9.34             8.84

   RUN TIME              SECONDS               504.             868.             504.             868.
   MEASURED DISTANCE     KM                     5.77             6.26             5.83             6.29
   SCF, DRY                                     .987      .989    .990             .988      .990   .990
        DFC, WET (DRY)                               .961( .956)                        .964( .959)
        TOT VOL (SCM) / SAM BLR (SCM)               375.3/ 79.58                       374.1/ 79.57
        KM  (MEASURED)                                  12.03                              12.12
        FUEL CONSUMPTION L/100KM                        10.23                               9.08

COMPOSITE RESULTS                                                                              3-BAG       (4-BAG)
   TEST NUMBER          6120-1                              CARBON DIOXIDE         G/KM        259.3      ( 256.4)
   BAROMETER     MM HG  748.0                               FUEL CONSUMPTION       L/100KM       9.69     (  9.58)
   HUMIDITY      G/KG     3.1                               HYDROCARBONS (THC)     G/KM          .07      (   .06)
   TEMPERATURE   DEG C   22.2                               CARBON MONOXIDE        G/KM          .57      (   .56)
                                                            OXIDES OF NITROGEN     G/KM          .92      (   .90)
                                                            PARTICULATES           G/KM          .233     (   .229)
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                                    FTP   - VEHICLE EMISSIONS RESULTS -32000 KM W/O TRAP
                                             PROJECT 05-5810-001

TEST NO.   6120-2   RUN   1                  VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE     2/11/82                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3            DIESEL     EM-465-F
TRANSMISSION A3                              DYNO NO.       2                       ODOMETER 44186. KM(27456. MILES)

BAROMETER 749.05 MM HG(29.49 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  30. PCT                   ABS. HUMIDITY  5.9 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .86
BAG RESULTS
   BAG NUMBER                                     1                  2                  3                  4
   DESCRIPTION                              COLD TRANSIENT       STABILIZED       HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)       711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)           584.2 (23.0)       584.2 (23.0)       584.2 (23.0)       584.2 (23.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)          34.4 ( 94.0)       33.9 ( 93.0)       34.4 ( 94.0)       33.3 ( 92.0)
   BLOWER REVOLUTIONS                          13854.             23832.             13829.             23849.
   TOT FLOW STD. CU. METRES(SCF)             136.9 ( 4832.)     235.7 ( 8322.)     136.6 ( 4824.)     236.1 ( 8337.)
   HC  SAMPLE METER/RANGE/PPM                13.0/11/  13.       8.2/11/   8.       9.0/11/   9.       8.3/11/   8.
   HC  BCKGRD METER/RANGE/PPM                 4.6/ 1/   5.       5.0/ 1/   5.       5.0/ 1/   5.       6.1/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM                28.8/13/  26.      17.1/13/  16.      22.8/13/  21.      16.8/13/  15.
   CO  BCKGRD METER/RANGE/PPM                 1.8/13/   2.       1.9/13/   2.       1.9/13/   2.       1.9/13/   2.
   CO2 SAMPLE METER/RANGE/PCT                44.2/ 3/  .76      25.0/ 3/  .41      38.0/ 3/  .64      24.2/ 3/  .39
   CO2 BCKGRD METER/RANGE/PCT                 2.6/ 3/  .04       2.9/ 3/  .04       2.7/ 3/  .04       2.6/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                25.9/ 2/  26.      15.1/ 2/  15.      24.9/ 2/  25.      14.1/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM                 1.0/ 2/   1.        .9/ 2/   1.        .6/ 2/   1.        .5/ 2/   1.
   DILUTION FACTOR                              17.62              32.69              20.82              33.84
   HC  CONCENTRATION PPM                         9.                 3.                 4.                 2.
   CO  CONCENTRATION PPM                        24.                14.                19.                13.
   CO2 CONCENTRATION PCT                         .72                .36                .60                .36
   NOX CONCENTRATION PPM                        25.0               14.2               24.3               13.6
   FILTER WT. MG (EFFICIENCY, %)             2.675 (99.)        2.235 (98.)        2.427 (99.)        2.190 (98.)
   HC  MASS GRAMS                                .68                .45                .33                .33
   CO  MASS GRAMS                               3.87               3.74               2.98               3.67
   CO2 MASS GRAMS                            1801.4             1573.2             1504.2             1535.2
   NOX MASS GRAMS                               5.64               5.54               5.49               5.31
   PARTICULATE MASS GRAMS                       1.69               1.41               1.52               1.41

   HC  GRAMS/KM                                  .12                .07                .06                .05
   CO  GRAMS/KM                                  .67                .58                .51                .58
   CO2 GRAMS/KM                               311.1              244.1              256.7              243.4
   NOX GRAMS/KM                                  .97                .86                .94                .84
   FUEL CONSUMPTION BY CB L/100KM              11.62               9.12               9.59               9.09

   RUN TIME              SECONDS               505.               868.               504.               869.
   MEASURED DISTANCE     KM                    5.79               6.45               5.86               6.31
   SCF, DRY                                    .983      .985      .987               .984      .986     .987
        DFC, WET (DRY)                               .960( .951)                          .964( .954)
        TOT VOL (SCM) / SAM BLR (SCM)               372.5/ 79.27                         372.7/ 79.22
        KM  (MEASURED)                                  12.24                                12.17
        FUEL CONSUMPTION L/100KM                        10.31                                 9.33

COMPOSITE RESULTS                                                                                       3-BAG      (4-BAG)
   TEST NUMBER         6120-2                                     CARBON DIOXIDE       G/KM      261.2     ( 261.0)
   BAROMETER    MM HG  749.0                                      FUEL CONSUMPTION     L/100KM     9.76    (   9.75)
   HUMIDITY     G/KG     5.9                                      HYDROCARBONS (THC)   G/KM         .08    (    .07)
   TEMPERATURE  DEG C   25.0                                      CARBON MONOXIDE      G/KM         .58    (    .58)
                                                                  OXIDES OF NITROGEN   G/KM         .90    (    .90)
                                                                  PARTICULATES         G/KM        .245    (   .246)
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                              FTP   - VEHICLE EMISSIONS RESULTS -32000 KM WITH TRAP
                                      PROJECT 05-5810-001

TEST NO.   6120T1   RUN   1                  VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE     2/ 8/82                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-465-F
TRANSMISSION A3                              DYNO NO.      2                        ODOMETER 43979. KM(27327. MILES)

BAROMETER 741.93 MM HG(29.21 IN HG)          DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
RELATIVE HUMIDITY  16. PCT                   ABS. HUMIDITY  2.7 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .79
BAG RESULTS
  BAG NUMBER                                      1                2                3                4
  DESCRIPTION                               COLD TRANSIENT     STABILIZED     HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)      711.2 (28.0)     711.2 (28.0)      711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)           584.2 (23.0)      584.2 (23.0)     584.2 (23.0)      584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          35.0 ( 95.0)      34.4 ( 94.0)     36.1 ( 97.0)      36.1 ( 97.0)
  BLOWER REVOLUTIONS                            13857.            23804.           13856.            23834.
  TOT FLOW STD. CU. METRES(SCF)             135.7 ( 4793.)    233.4 ( 8243.)   135.5 ( 4784.)    233.1 ( 8229.)
  HC  SAMPLE METER/RANGE/PPM                15.4/11/  15.     11.4/11/  11.    11.7/11/  12.     10.5/11/  10.
  HC  BCKGRD METER/RANGE/PPM                 9.4/ 1/   9.      8.1/ 1/   8.     8.1/ 1/   8.      9.5/ 1/  10.
  CO  SAMPLE METER/RANGE/PPM                28.7/13/  26.     17.5/13/  16.    22.3/13/  20.     18.2/13/  17.
  CO  BCKGRD METER/RANGE/PPM                 2.5/13/   2.      2.3/13/   2.     1.7/13/   2.      3.5/13/   3.
  CO2 SAMPLE METER/RANGE/PCT                43.8/ 3/  .75     24.6/ 3/  .40    36.5/ 3/  .61     23.8/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                 3.0/ 3/  .05      2.8/ 3/  .04     2.5/ 3/  .04      2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                25.2/ 2/  25.     15.1/ 2/  15.    24.0/ 2/  24.     14.9/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                  .4/ 2/   0.       .4/ 2/   0.      .7/ 2/   1.       .4/ 2/   0.
  DILUTION FACTOR                               17.80             33.22            21.74             34.41
  HC  CONCENTRATION PPM                           7.                4.               4.                1.
  CO  CONCENTRATION PPM                          24.               14.              19.               13.
  CO2 CONCENTRATION PCT                          .71               .36              .58               .35
  NOX CONCENTRATION PPM                         24.8              14.7             23.3              14.5
  FILTER WT. MG (EFFICIENCY, %)              .192 (85.)        .152 (79.)       .170 (72.)        .125 (74.)
  HC  MASS GRAMS                                 .51               .48              .31               .17
  CO  MASS GRAMS                                3.75              3.72             2.92              3.60
  CO2 MASS GRAMS                              1753.5            1534.8           1430.5            1492.1
  NOX MASS GRAMS                                5.10              5.20             4.78              5.12
  PARTICULATE MASS GRAMS                         .13               .11              .14               .10

  HC  GRAMS/KM                                   .09               .08              .05               .03
  CO  GRAMS/KM                                   .64               .59              .50               .57
  CO2 GRAMS/KM                                 301.3             243.2            244.0             236.4
  NOX GRAMS/KM                                   .88               .82              .82               .81
  FUEL CONSUMPTION BY CB L/100KM               11.25              9.09             9.11              8.83

  RUN TIME              SECONDS                 505.              867.             505.              868.
  MEASURED DISTANCE     KM                      5.82              6.31             5.86              6.31
  SCF, DRY                                      .988      .990     .991             .989      .991    .991
      DFC, WET (DRY)                                  .960( .955)                        .965( .960)
      TOT VOL (SCM) / SAM BLR (SCM)                  369.2/ 79.36                       368.5/ 79.36
      KM  (MEASURED)                                    12.13                              12.17
      FUEL CONSUMPTION L/100KM                          10.13                               8.97

COMPOSITE RESULTS                                                                            3-BAG      (4-BAG)
  TEST NUMBER          6120T1                          CARBON DIOXIDE        G/KM         255.4      ( 253.4)
  BAROMETER    MM HG   741.9                           FUEL CONSUMPTION      L/100KM        9.54     (   9.47)
  HUMIDITY     G/KG      2.7                           HYDROCARBONS (THC)    G/KM            .07     (    .06)
  TEMPERATURE  DEG C    22.2                           CARBON MONOXIDE       G/KM            .58     (    .57)
                                                       OXIDES OF NITROGEN    G/KM            .83     (    .83)
                                                       PARTICULATES          G/KM           .021     (   .020)
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                          FTP   - VEHICLE EMISSIONS RESULTS -32000 KM WITH TRAP
                                   PROJECT 05-5810-001

TEST NO.   6120T2   RUN   1             VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D        DATE    2/ 9/82                        ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5              BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-465-F
TRANSMISSION A3                         DYNO NO.      2                        ODOMETER 44086. KM(27394. MILES)

BAROMETER 748.79 MM HG(29.48 IN HG)     DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)
RELATIVE HUMIDITY  24. PCT              ABS. HUMIDITY  3.9 GM/KG               NOX HUMIDITY CORRECTION FACTOR   .82
BAG RESULTS
   BAG NUMBER                                  1                  2                  3                  4
   DESCRIPTION                          COLD TRANSIENT       STABILIZED       HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)         711.2 (28.0)       711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
   BLOWER INLET P MM. H2O(IN. H2O)       584.2 (23.0)       584.2 (23.0)       584.2 (23.0)       584.2 (23.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)      29.4 ( 85.0)       30.6 ( 87.0)       35.6 ( 96.0)       35.0 ( 95.0)
   BLOWER REVOLUTIONS                       13837.             23815.             13876.             23811.
   TOT FLOW STD. CU. METRES(SCF)         138.4 ( 4888.)     237.5 ( 8387.)     136.9 ( 4834.)     235.1 ( 8303.)
   HC  SAMPLE METER/RANGE/PPM            14.7/11/  15.       7.1/11/   7.      7.9/11/   8.      6.7/11/   7.
   HC  BCKGRD METER/RANGE/PPM             7.5/ 1/   8.       4.0/ 1/   4.      4.0/ 1/   4.      4.4/ 1/   4.
   CO  SAMPLE METER/RANGE/PPM            27.9/13/  26.      15.1/13/  14.     21.2/13/  19.     13.9/13/  13.
   CO  BCKGRD METER/RANGE/PPM              .8/13/   1.        .5/13/   0.       .1/13/   0.       .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT            43.0/ 3/  .73      24.1/ 3/  .39     36.9/ 3/  .62     23.2/ 3/  .38
   CO2 BCKGRD METER/RANGE/PCT             2.7/ 3/  .04       2.2/ 3/  .03      2.5/ 3/  .04      2.3/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM            25.1/ 2/  25.      15.1/ 2/  15.     25.6/ 2/  26.     15.1/ 2/  15.
   NOX BCKGRD METER/RANGE/PPM              .1/ 2/   0.        .1/ 2/   0.       .5/ 2/   1.       .4/ 2/   0.
   DILUTION FACTOR                           18.16              34.01              21.50              35.42
   HC  CONCENTRATION PPM                     8.                 3.                 4.                 2.
   CO  CONCENTRATION PPM                    24.                13.                19.                12.
   CO2 CONCENTRATION PCT                     .69                .36                .58                .34
   NOX CONCENTRATION PPM                    25.0               15.0               25.1               14.7
   FILTER WT. MG (EFFICIENCY, %)         .267 (86.)         .152 (77.)         .248 (83.)         .270 (86.)
   HC  MASS GRAMS                            .61                .44                .32                .32
   CO  MASS GRAMS                           3.92               3.61               3.00               3.37
   CO2 MASS GRAMS                         1761.1             1562.8             1464.0             1473.5
   NOX MASS GRAMS                           5.41               5.57               5.37               5.40
   PARTICULATE MASS GRAMS                    .19                .12                .19                .20

   HC  GRAMS/KM                              .11                .07                .05                .05
   CO  GRAMS/KM                              .68                .58                .51                .54
   CO2 GRAMS/KM                            303.2              252.2              249.5              235.1
   NOX GRAMS/KM                              .93                .90                .92                .86
   FUEL CONSUMPTION BY CB L/100KM          11.33               9.42               9.32               8.78

   RUN TIME             SECONDS           504.               868.               506.               867.
   MEASURED DISTANCE    KM                5.81               6.20               5.87               6.27
   SCF, DRY                               .985       .987    .989               .987       .988    .989
      DFC, WET (DRY)                           .961( .954)                          .965( .958)
      TOT VOL (SCM) / SAM BLR (SCM)           376.0/ 79.43                         372.1/ 79.42
      KM  (MEASURED)                             12.00                                12.14
      FUEL CONSUMPTION L/100KM                   10.35                                 9.04

COMPOSITE RESULTS                                                                      3-BAG        (4-BAG)
   TEST NUMBER          6120T2                    CARBON DIOXIDE        G/KM           262.1        ( 257.0)
   BAROMETER    MM HG    748.8                    FUEL CONSUMPTION      L/100KM         9.79        (   9.60)
   HUMIDITY     G/KG       3.9                    HYDROCARBONS (THC)    G/KM             .07        (    .07)
   TEMPERATURE  DEG C     21.7                    CARBON MONOXIDE       G/KM             .58        (    .57)
                                                  OXIDES OF NITROGEN    G/KM             .91        (    .90)
                                                  PARTICULATES          G/KM            .026        (   .029)
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                        FTP   - VEHICLE EMISSIONS RESULTS -40000 KM W/OUT TRAP
                                 PROJECT 05-5810-001

TEST NO.   6125-1   RUN   1                VEHICLE NO.61                                TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE    3/ 3/82                              ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO. 1 / CVS NO.  3                  DIESEL     EM-465-F
TRANSMISSION A3                            DYNO NO.       2                             ODOMETER 52608. KM(32689. MILES)

BAROMETER 734.31 MM HG(28.91 IN HG)        DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  48. PCT                 ABS. HUMIDITY  9.2 GM/KG                     NOX HUMIDITY CORRECTION FACTOR   .95
BAG RESULTS
  BAG NUMBER                                      1                 2                  3                  4
  DESCRIPTION                               COLD TRANSIENT      STABILIZED        HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)       711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)           584.2 (23.0)       584.2 (23.0)       584.2 (23.0)       584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          35.6 ( 96.0)       35.6 ( 96.0)       36.1 ( 97.0)       35.0 ( 95.0)
  BLOWER REVOLUTIONS                          13859.             23826.             13840.             23832.
  TOT FLOW STD. CU. METRES(SCF)             133.8 ( 4723.)     230.0 ( 8121.)     133.5 ( 4713.)     230.2 ( 8130.)
  HC  SAMPLE METER/RANGE/PPM                17.1/11/  17.      11.0/11/  11.      11.4/11/  11.      10.9/11/  11.
  HC  BCKGRD METER/RANGE/PPM                 8.0/ 1/   8.       7.2/ 1/   7.       7.2/ 1/   7.       5.8/ 1/   6.
  CO  SAMPLE METER/RANGE/PPM                27.4/13/  25.      15.0/13/  14.      20.5/13/  19.      14.9/13/  14.
  CO  BCKGRD METER/RANGE/PPM                  .7/13/   1.        .1/13/   0.        .1/13/   0.        .3/13/   0.
  CO2 SAMPLE METER/RANGE/PCT                44.9/ 3/  .77      25.4/ 3/  .41      38.2/ 3/  .64      24.6/ 3/  .40
  CO2 BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04       2.9/ 3/  .04       3.0/ 3/  .05       3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                24.4/ 2/  24.      13.9/ 2/  14.      22.8/ 2/  23.      13.4/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                  .5/ 2/   1.        .5/ 2/   1.        .5/ 2/   1.        .5/ 2/   1.
  DILUTION FACTOR                              17.32              32.14              20.70              33.25
  HC  CONCENTRATION PPM                          10.                 4.                 5.                 5.
  CO  CONCENTRATION PPM                          24.                13.                18.                13.
  CO2 CONCENTRATION PCT                          .73                .37                .60                .35
  NOX CONCENTRATION PPM                         23.9               13.4               22.3               12.9
  FILTER WT. MG (EFFICIENCY, $)             3.152 (99.)        2.312 (98.)        2.421 (99.)        2.090 (98.)
  HC  MASS GRAMS                                 .74                .53                .35                .70
  CO  MASS GRAMS                                3.70               3.53               2.81               3.47
  CO2 MASS GRAMS                              1782.6             1564.7             1467.8             1494.8
  NOX MASS GRAMS                                5.83               5.62               5.43               5.42
  PARTICULATE MASS GRAMS                        1.95               1.46               1.50               1.33

  HC  GRAMS/KM                                   .13                .08                .06                .11
  CO  GRAMS/KM                                   .63                .56                .48                .55
  CO2 GRAMS/KM                                 303.7              248.0              250.9              235.7
  NOX GRAMS/KM                                   .99                .89                .93                .85
  FUEL CONSUMPTION BY CB L/100KM               11.35               9.27               9.37               8.81

  RUN TIME              SECONDS                505.               868.               504.               868.
  MEASURED DISTANCE     KM                      5.87               6.31               5.85               6.34
  SCF, DRY                                      .977               .981               .979               .981
      DFC, WET (DRY)                                      .979                                  .980
      TOT VOL (SCM) / SAM BLR (SCM)                   .959( .944)                          .963( .948)
      KM  (MEASURED)                                363.8/ 77.56                         363.7/ 77.53
      FUEL CONSUMPTION L/100KM                         12.18                                12.19
                                                       10.27                                 9.08
COMPOSITE RESULTS
  TEST NUMBER          6125-1                                                                3-BAG      (4-BAG)
  BAROMETER    MM HG   734.3                CARBON DIOXIDE          G/KM                     260.3     ( 256.7)
  HUMIDITY     G/KG      9.2                FUEL CONSUMPTION        L/100KM                   9.73     (   9.59)
  TEMPERATURE  DEG C    23.9                HYDROCARBONS (THC)      G/KM                      .09      (   .09)
                                            CARBON MONOXIDE         G/KM                      .55      (   .55)
                                            OXIDES OF NITROGEN      G/KM                      .92      (   .91)
                                            PARTICULATES            G/KM                      .259     (  .253)
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                                         FTP   - VEHICLE EMISSIONS RESULTS -40000 KM W/OUT TRAP
                                                 PROJECT 05-5810-001

TEST NO.   6125-2   RUN   1                      VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                 DATE    3/ 4/82                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                       BAG CART NO. 1 / CVS NO.  3          DIESEL    EM-465-F
TRANSMISSION A3                                  DYNO NO.      2                      ODOMETER 38111. KM(23681. MILES)

BAROMETER 732.79 MM HG(28.85 IN HG)              DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  53. PCT                       ABS. HUMIDITY 10.9 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                                          1                  2                  3                  4
  DESCRIPTION                                  COLD TRANSIENT       STABILIZED        HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                 711.2 (28.0)       711.2 (28.0)       711.2 (28.0)       711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)               584.2 (23.0)       584.2 (23.0)       584.2 (23.0)       584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)              36.1 ( 97.0)       35.0 ( 95.0)       35.0 ( 95.0)       35.0 ( 95.0)
  BLOWER REVOLUTIONS                               13872.             23821.             13856.             23817.
  TOT FLOW STD. CU. METRES(SCF)                 133.4 ( 4710.)     229.5 ( 8103.)     133.5 ( 4713.)     229.4 ( 8102.)
  HC  SAMPLE METER/RANGE/PPM                    15.6/11/  16.      11.0/11/  11.      11.4/11/  11.      10.3/11/  10.
  HC  BCKGRD METER/RANGE/PPM                     7.6/ 1/   8.       6.5/ 1/   7.       6.5/ 1/   7.       6.6/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM                    28.8/13/  26.      17.5/13/  16.      22.8/13/  21.      17.8/13/  16.
  CO  BCKGRD METER/RANGE/PPM                     1.2/13/   1.       1.0/13/   1.       1.0/13/   1.       2.2/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                    44.5/ 3/  .76      26.0/ 3/  .43      37.7/ 3/  .64      24.4/ 3/  .40
  CO2 BCKGRD METER/RANGE/PCT                     2.6/ 3/  .04       2.7/ 3/  .04       2.3/ 3/  .04       2.6/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                    24.1/ 2/  24.      14.8/ 2/  15.      23.2/ 2/  23.      13.9/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                      .7/ 2/   1.        .6/ 2/   1.        .8/ 2/   1.        .8/ 2/   1.
  DILUTION FACTOR                                   17.49              31.33              20.99              33.52
  HC  CONCENTRATION PPM                              8.                 5.                 5.                 4.
  CO  CONCENTRATION PPM                             25.                15.                19.                14.
  CO2 CONCENTRATION PCT                              .72                .39                .60                .36
  NOX CONCENTRATION PPM                             23.4               14.2               22.4               13.1
  FILTER WT. MG (EFFICIENCY, %)                 2.598 (98.)        2.292 (99.)        2.399 (99.)        2.200 (98.)
  HC  MASS GRAMS                                     .65                .63                .40                .52
  CO  MASS GRAMS                                    3.82               3.91               3.01               3.71
  CO2 MASS GRAMS                                  1769.6             1618.0             1470.4             1506.4
  NOX MASS GRAMS                                    6.01               6.27               5.75               5.79
  PARTICULATE MASS GRAMS                            1.58               1.44               1.50               1.39

  HC  GRAMS/KM                                       .11                .10                .07                .08
  CO  GRAMS/KM                                       .66                .63                .53                .60
  CO2 GRAMS/KM                                     307.5              259.1              256.8              244.3
  NOX GRAMS/KM                                      1.04               1.00               1.00                .94
  FUEL CONSUMPTION BY CB L/100KM                   11.49               9.69               9.59               9.13

  RUN TIME               SECONDS                505.               868.               505.               868.
  MEASURED DISTANCE      KM                     5.76               6.24               5.73               6.17
  SCF, DRY                                      .976       .978    .979               .977       .978    .979
       DFC, WET (DRY)                                 .959( .942)                          .964( .947)
       TOT VOL (SCM) / SAM BLR (SCM)                 362.9/ 77.21                         362.9/ 77.15
       KM  (MEASURED)                                    12.00                                11.89
       FUEL CONSUMPTION L/100KM                          10.55                                 9.35

COMPOSITE RESULTS
  TEST NUMBER           6125-2                                                         3-BAG      (4-BAG)
  BAROMETER    MM HG    732.8                      CARBON DIOXIDE       G/KM          268.5      ( 264.1)
  HUMIDITY     G/KG      10.9                      FUEL CONSUMPTION     L/100KM       10.03      (  9.87)
  TEMPERATURE  DEG C     25.0                      HYDROCARBONS (THC)   G/KM            .09      (   .09)
                                                   CARBON MONOXIDE      G/KM            .61      (   .60)
                                                   OXIDES OF NITROGEN   G/KM           1.01      (   .99)
                                                   PARTICULATES         G/KM           .248      (  .247)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -40000 KM WITH TRAP
                                                PROJECT 05-5810-001

TEST NO.   6125T2   RUN   1                  VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE    3/ 2/82                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3          DIESEL     EM-465-F
TRANSMISSION A3                              DYNO NO.      2                      ODOMETER 52521. KM(32635. MILES)

BAROMETER 744.47 MM HG(29.31 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  33. PCT                   ABS. HUMIDITY  6.6 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .88
BAG RESULTS
  BAG NUMBER                                       1                 2                 3                 4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED      HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             711.2 (28.0)      711.2 (28.0)      711.2 (28.0)      711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)           584.2 (23.0)      584.2 (23.0)      584.2 (23.0)      584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          34.4 ( 94.0)      35.0 ( 95.0)      35.0 ( 95.0)      35.6 ( 96.0)
  BLOWER REVOLUTIONS                           13840.            23805.            13840.            23815.
  TOT FLOW STD. CU. METRES(SCF)             135.9 ( 4799.)    233.5 ( 8246.)    135.7 ( 4793.)    233.4 ( 8240.)
  HC  SAMPLE METER/RANGE/PPM                12.8/11/  13.      7.7/11/   8.      8.8/11/   9.      8.0/11/   8.
  HC  BCKGRD METER/RANGE/PPM                 5.3/ 1/   5.      5.5/ 1/   6.      5.5/ 1/   6.      7.2/ 1/   7.
  CO  SAMPLE METER/RANGE/PPM                30.3/13/  28.     17.2/13/  16.     22.7/13/  21.     16.2/13/  15.
  CO  BCKGRD METER/RANGE/PPM                 1.5/13/   1.      1.5/13/   1.      1.5/13/   1.      1.4/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                44.7/ 3/  .77     25.3/ 3/  .41     38.0/ 3/  .64     24.1/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04      2.7/ 3/  .04      2.9/ 3/  .04      2.9/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                23.7/ 2/  24.     14.6/ 2/  15.     23.0/ 2/  23.     13.6/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                  .7/ 2/   1.       .6/ 2/   1.       .6/ 2/   1.       .6/ 2/   1.
  DILUTION FACTOR                              17.41             32.28             20.82             33.99
  HC  CONCENTRATION PPM                         8.                2.                4.                1.
  CO  CONCENTRATION PPM                        26.               14.               19.               13.
  CO2 CONCENTRATION PCT                         .72               .37               .60               .35
  NOX CONCENTRATION PPM                        23.0              14.0              22.4              13.0
  FILTER WT. MG (EFFICIENCY, %)             .496 (88.)        .283 (87.)        .324 (86.)        .220 (85.)
  HC  MASS GRAMS                                .62               .32               .28               .14
  CO  MASS GRAMS                               4.10              3.82              3.00              3.59
  CO2 MASS GRAMS                             1801.6            1594.0            1487.3            1490.8
  NOX MASS GRAMS                               5.28              5.52              5.13              5.12
  PARTICULATE MASS GRAMS                        .35               .20               .24               .16

  HC  GRAMS/KM                                  .11               .05               .05               .02
  CO  GRAMS/KM                                  .70               .60               .51               .57
  CO2 GRAMS/KM                                308.1             252.0             255.0             237.1
  NOX GRAMS/KM                                  .90               .87               .88               .81
  FUEL CONSUMPTION BY CB L/100KM              11.51              9.42              9.52              8.85

  RUN TIME               SECONDS               504.              868.              504.              868.
  MEASURED DISTANCE      KM                    5.85              6.32              5.83              6.29
  SCF, DRY                                     .982      .984      .986              .983      .985    .986
     DFC, WET (DRY)                                 .959( .949)                          .964( .954)
     TOT VOL (SCM) / SAM BLR (SCM)                 369.4/ 78.81                        369.1/ 78.76
     KM  (MEASURED)                                    12.17                               12.12
     FUEL CONSUMPTION L/100KM                          10.42                                9.18

COMPOSITE RESULTS                                                                          3-BAG       (4-BAG)
  TEST NUMBER          6125T2                                  CARBON DIOXIDE       G/KM     264.4      ( 260.0)
  BAROMETER    MM HG   744.5                                   FUEL CONSUMPTION     L/100KM    9.88     (   9.71)
  HUMIDITY     G/KG      6.6                                   HYDROCARBONS (THC)   G/KM        .06     (    .05)
  TEMPERATURE  DEG C    25.0                                   CARBON MONOXIDE      G/KM        .60     (    .59)
                                                               OXIDES OF NITROGEN   G/KM        .88     (    .86)
                                                               PARTICULATES         G/KM       .040     (   .038)
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                                  FTP   - VEHICLE EMISSIONS RESULTS -40000 KM  WITH TRAP
                                          PROJECT 05-5810-001

TEST NO.   6125T1   RUN   1                 VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D            DATE    3/ 1/82                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                  BAG CART NO. 1 / CVS NO.  3          DIESEL    EM-465-F
TRANSMISSION A3                             DYNO NO.      2                      ODOMETER 52341. KM(32523. MILES)

BAROMETER 752.35 MM HG(29.62 IN HG)         DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  32. PCT                  ABS. HUMIDITY  6.1 GM/KG             NOX HUMIDITY CORRECTION FACTOR   .87
BAG RESULTS
  BAG NUMBER                                      1                2                  3                 4
  DESCRIPTION                              COLD TRANSIENT     STABILIZED        HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)            711.2 (28.0)      711.2 (28.0)      711.2 (28.0)      711.2 (28.0)
  BLOWER INLET P MM. H2O(IN. H2O)          584.2 (23.0)      584.2 (23.0)      584.2 (23.0)      584.2 (23.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)         33.9 ( 93.0)      34.4 ( 94.0)      35.0 ( 95.0)      34.4 ( 94.0)
  BLOWER REVOLUTIONS                          13845.            23808.            13838.            23823.
  TOT FLOW STD. CU. METRES(SCF)            137.8 ( 4867.)    236.8 ( 8360.)    137.5 ( 4854.)    236.9 ( 8365.)
  HC  SAMPLE METER/RANGE/PPM               12.2/11/  12.      8.5/11/   9.     10.6/11/  11.     11.2/11/  11.
  HC  BCKGRD METER/RANGE/PPM                8.4/ 1/   8.      6.5/ 1/   7.      6.5/ 1/   7.      9.7/ 1/  10.
  CO  SAMPLE METER/RANGE/PPM               33.0/13/  30.     20.3/13/  18.     25.0/13/  23.     18.1/13/  16.
  CO  BCKGRD METER/RANGE/PPM                6.5/13/   6.      5.6/13/   5.      4.6/13/   4.      3.8/13/   3.
  CO2 SAMPLE METER/RANGE/PCT               44.4/ 3/  .76     24.5/ 3/  .40     37.1/ 3/  .62     23.5/ 3/  .38
  CO2 BCKGRD METER/RANGE/PCT                3.2/ 3/  .05      3.1/ 3/  .05      3.1/ 3/  .05      3.2/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM               25.0/ 2/  25.     14.4/ 2/  14.     23.2/ 2/  23.     13.5/ 2/  14.
  NOX BCKGRD METER/RANGE/PPM                 .9/ 2/   1.       .8/ 2/   1.       .8/ 2/   1.       .7/ 2/   1.
  DILUTION FACTOR                             17.53             33.37             21.36             34.87
  HC  CONCENTRATION PPM                        4.                2.                4.                2.
  CO  CONCENTRATION PPM                       24.               13.               18.               13.
  CO2 CONCENTRATION PCT                        .71               .35               .58               .33
  NOX CONCENTRATION PPM                       24.2              13.6              22.4              12.8
  FILTER WT. MG (EFFICIENCY, %)              .251 (88.)        .163 (78.)        .200 (86.)        .148 (76.)
  HC  MASS GRAMS                               .34               .30               .35               .24
  CO  MASS GRAMS                              3.88              3.67              2.95              3.55
  CO2 MASS GRAMS                            1801.7            1529.7            1457.0            1448.5
  NOX MASS GRAMS                              5.53              5.36              5.12              5.05
  PARTICULATE MASS GRAMS                       .18               .13               .15               .12

  HC  GRAMS/KM                                 .06               .05               .06               .04
  CO  GRAMS/KM                                 .66               .58               .50               .56
  CO2 GRAMS/KM                               305.5             243.5             249.3             230.1
  NOX GRAMS/KM                                 .94               .85               .88               .80
  FUEL CONSUMPTION BY CB L/100KM             11.41              9.10              9.31              8.60

  RUN TIME             SECONDS                505.              868.              504.              868.
  MEASURED DISTANCE    KM                     5.90              6.28              5.85              6.30
  SCF, DRY                                    .983      .985    .986              .984      .985    .986
      DFC, WET (DRY)                               .960( .950)                         .965( .955)
      TOT VOL (SCM) / SAM BLR (SCM)               374.6/ 80.21                        374.4/ 80.23
      KM  (MEASURED)                                 12.18                               12.14
      FUEL CONSUMPTION L/100KM                       10.22                                8.94

COMPOSITE RESULTS                                                                               3-BAG       (4-BAG)
  TEST NUMBER        6125T1                                 CARBON DIOXIDE       G/KM          258.0       ( 254.0)
  BAROMETER    MM HG  752.3                                 FUEL CONSUMPTION     L/100KM         9.64      (   9.49)
  HUMIDITY     G/KG     6.1                                 HYDROCARBONS (THC)   G/KM             .05      (    .05)
  TEMPERATURE  DEG C   24.4                                 CARBON MONOXIDE      G/KM             .58      (    .57)
                                                            OXIDES OF NITROGEN   G/KM             .88      (    .86)
                                                            PARTICULATES         G/KM            .024      (   .024)
                                          FTP   - VEHICLE EMISSIONS RESULTS -48000 KM W/O TRAP
                                                  PROJECT 05-5810-001

TEST NO.   6130-1   RUN   1                  VEHICLE NO.61                            TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE    3/26/82                          ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3              DIESEL    EM-465-F
TRANSMISSION A3                              DYNO NO.       2                         ODOMETER 60511. KM(37600. MILES)

BAROMETER 748.28 MM HG(29.46 IN HG)          DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
RELATIVE HUMIDITY  25. PCT                   ABS. HUMIDITY  4.2 GM/KG                 NOX HUMIDITY CORRECTION FACTOR   .82
BAG RESULTS
  BAG NUMBER                                      1                   2                   3                   4
  DESCRIPTION                              COLD TRANSIENT        STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             685.8 (27.0)        685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)           558.8 (22.0)        558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          35.0 ( 95.0)        30.0 ( 86.0)        33.9 ( 93.0)        32.8 ( 91.0)
  BLOWER REVOLUTIONS                           13880.              23813.              13877.              23874.
  TOT FLOW STD. CU. METRES(SCF)             136.4 ( 4816.)      236.7 ( 8359.)      136.7 ( 4827.)      235.4 ( 8310.)
  HC  SAMPLE METER/RANGE/PPM                13.8/11/  14.        8.8/11/   9.        9.5/11/  10.        8.3/11/   8.
  HC  BCKGRD METER/RANGE/PPM                 5.3/ 1/   5.        5.0/ 1/   5.        5.0/ 1/   5.        5.4/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                30.0/13/  28.       16.4/13/  15.       22.4/13/  20.       15.9/13/  14.
  CO  BCKGRD METER/RANGE/PPM                 1.2/13/   1.        1.3/13/   1.        1.6/13/   1.        1.6/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                40.7/ 3/  .69       24.3/ 3/  .40       34.7/ 3/  .58       23.9/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04        2.9/ 3/  .04        2.8/ 3/  .04        2.8/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                24.1/ 2/  24.       15.1/ 2/  15.       23.4/ 2/  23.       14.9/ 2/  15.
  NOX BCKGRD METER/RANGE/PPM                  .7/ 2/   1.         .9/ 2/   1.        1.0/ 2/   1.        1.0/ 2/   1.
  DILUTION FACTOR                              19.29               33.69               22.98               34.29
  HC  CONCENTRATION PPM                         9.                  4.                  5.                  3.
  CO  CONCENTRATION PPM                        26.                 14.                 19.                 13.
  CO2 CONCENTRATION PCT                         .65                 .35                 .54                 .35
  NOX CONCENTRATION PPM                        23.4                14.2                22.4                13.9
  FILTER WT. MG (EFFICIENCY, $)              2.777 (98.)         2.502 (95.)         2.284 (99.)         2.354 (97.)
  HC  MASS GRAMS                                .69                 .53                 .37                 .41
  CO  MASS GRAMS                               4.12                3.73                2.97                3.51
  CO2 MASS GRAMS                             1620.0              1527.3              1349.8              1494.9
  NOX MASS GRAMS                               5.04                5.31                4.83                5.17
  PARTICULATE MASS GRAMS                       1.74                1.56                1.42                1.47

  HC  GRAMS/KM                                  .12                 .09                 .07                 .07
  CO  GRAMS/KM                                  .72                 .61                 .52                 .57
  CO2 GRAMS/KM                                283.9               250.7               236.3               244.6
  NOX GRAMS/KM                                  .88                 .87                 .85                 .85
  FUEL CONSUMPTION BY CB L/100KM              10.62                9.37                8.83                9.14

  RUN TIME                   SECONDS           505.                868.                505.                862.
  MEASURED DISTANCE          KM                5.71                6.09                5.71                6.11
  SCF, DRY                                     .986       .987     .988                .987       .988     .988
       DFC, WET (DRY)                                 .962( .954)                             .966( .958)
       TOT VOL (SCM) / SAM BLR (SCM)                 373.1/ 78.10                            372.1/ 78.23
       KM  (MEASURED)                                   11.80                                   11.82
       FUEL CONSUMPTION L/100KM                          9.97                                    8.99

COMPOSITE RESULTS
  TEST NUMBER              6130-1                                                              3-BAG       (4-BAG)
  BAROMETER      MM HG     748.3                     CARBON DIOXIDE         G/KM              253.6       ( 251.8)
  HUMIDITY       G/KG        4.2                     FUEL CONSUMPTION       L/100KM            9.48       (  9.41)
  TEMPERATURE    DEG C      22.2                     HYDROCARBONS (THC)     G/KM                .09       (   .08)
                                                     CARBON MONOXIDE        G/KM                .61       (   .60)
                                                     OXIDES OF NITROGEN     G/KM                .87       (   .86)
                                                     PARTICULATES           G/KM               .265       (  .260)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -48000 KM W/O TRAP
                                                 PROJECT 05-5810-001

TEST NO.   6130-2   RUN   1                VEHICLE NO.61                              TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE     3/29/82                           ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO. 1 / CVS NO.  3                DIESEL     EM-465-F
TRANSMISSION A3                            DYNO NO.      2                            ODOMETER 60865. KM(37820. MILES)

BAROMETER 742.44 MM HG(29.23 IN HG)        DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
RELATIVE HUMIDITY  64. PCT                 ABS. HUMIDITY 10.3 GM/KG                   NOX HUMIDITY CORRECTION FACTOR   .99
BAG RESULTS
   BAG NUMBER                                    1                    2                    3                    4
   DESCRIPTION                             COLD TRANSIENT        STABILIZED          HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           685.8 (27.0)         685.8 (27.0)         685.8 (27.0)         685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)         558.8 (22.0)         558.8 (22.0)         558.8 (22.0)         558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)        37.8 (100.0)         35.0 ( 95.0)         35.6 ( 96.0)         35.0 ( 95.0)
   BLOWER REVOLUTIONS                         13866.               23807.               13865.               23745.
   TOT FLOW STD. CU. METRES(SCF)          135.0 ( 4766.)       232.8 ( 8220.)       135.4 ( 4780.)       232.2 ( 8200.)
   HC  SAMPLE METER/RANGE/PPM             14.5/11/  15.         9.3/11/   9.        10.4/11/  10.         9.1/11/   9.
   HC  BCKGRD METER/RANGE/PPM              5.5/ 1/   6.         5.2/ 1/   5.         5.2/ 1/   5.         6.6/ 1/   7.
   CO  SAMPLE METER/RANGE/PPM             29.4/13/  27.        16.6/13/  15.        22.3/13/  20.        16.3/13/  15.
   CO  BCKGRD METER/RANGE/PPM              1.1/13/   1.          .8/13/   1.         1.0/13/   1.         1.0/13/   1.
   CO2 SAMPLE METER/RANGE/PCT             43.5/ 3/  .74        25.6/ 3/  .42        36.6/ 3/  .61        24.7/ 3/  .40
   CO2 BCKGRD METER/RANGE/PCT              2.8/ 3/  .04         2.8/ 3/  .04         2.5/ 3/  .04         2.8/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM             23.4/ 2/  23.        14.0/ 2/  14.        22.2/ 2/  22.        14.5/ 2/  15.
   NOX BCKGRD METER/RANGE/PPM               .8/ 2/   1.          .8/ 2/   1.         1.5/ 2/   2.         1.8/ 2/   2.
   DILUTION FACTOR                            17.93                31.87                21.68                33.11
   HC  CONCENTRATION PPM                       9.                   4.                   5.                   3.
   CO  CONCENTRATION PPM                      25.                  14.                  19.                  14.
   CO2 CONCENTRATION PCT                       .70                  .38                  .58                  .36
   NOX CONCENTRATION PPM                      22.6                 13.2                 20.8                 12.8
   FILTER WT. MG (EFFICIENCY, $)          3.168 (98.)          2.612 (97.)          2.735 (98.)          2.584 (98.)
   HC  MASS GRAMS                               .73                  .58                  .42                  .36
   CO  MASS GRAMS                              3.95                 3.78                 2.97                 3.65
   CO2 MASS GRAMS                            1736.9               1605.1               1433.8               1534.3
   NOX MASS GRAMS                              5.76                 5.80                 5.30                 5.58
   PARTICULATE MASS GRAMS                      1.93                 1.63                 1.65                 1.55

   HC  GRAMS/KM                                 .13                  .09                  .07                  .06
   CO  GRAMS/KM                                 .69                  .61                  .51                  .59
   CO2 GRAMS/KM                               303.4                260.5                248.4                248.9
   NOX GRAMS/KM                                1.01                  .94                  .92                  .91
   FUEL CONSUMPTION BY CB L/100KM             11.34                 9.74                 9.28                 9.30

   RUN TIME              SECONDS               505.                 870.                 505.                 868.
   MEASURED DISTANCE     KM                    5.72                 6.16                 5.77                 6.16
   SCF, DRY                                    .972                 .975                 .974                 .976
        DFC, WET (DRY)                                  .974                                      .975
        TOT VOL (SCM) / SAM BLR (SCM)               .960( .940)                               .964( .944)
        KM  (MEASURED)                            367.8/ 77.46                              367.6/ 77.30
        FUEL CONSUMPTION L/100KM                      11.89                                     11.94
                                                      10.51                                      9.29

COMPOSITE RESULTS
   TEST NUMBER          6130-2                                                                 3-BAG      (4-BAG)
   BAROMETER    MM HG   742.4                    CARBON DIOXIDE          G/KM              266.1      ( 262.7)
   HUMIDITY     G/KG     10.3                    FUEL CONSUMPTION        L/100KM             9.94      (  9.81)
   TEMPERATURE  DEG C    21.1                    HYDROCARBONS (THC)      G/KM                 .09      (   .08)
                                                 CARBON MONOXIDE         G/KM                 .60      (   .60)
                                                 OXIDES OF NITROGEN      G/KM                 .95      (   .94)
                                                 PARTICULATES            G/KM                .285      (  .282)
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                                          FTP   - VEHICLE EMISSIONS RESULTS -48000 KM WITH TRAP
                                                  PROJECT 05-5810-001

 TEST NO.   6130T1   RUN   1                    VEHICLE NO.61                             TEST WEIGHT  1814. KG( 4000. LBS)
 VEHICLE MODEL   80 MERCEDES 300D               DATE     3/24/82                          ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
 ENGINE 3.0 L(183. CID) L-5                     BAG CART NO. 1 / CVS NO.  3               DIESEL    EM-465-F
 TRANSMISSION A3                                DYNO NO.       2                          ODOMETER 60447. KM(37560. MILES)

 BAROMETER 733.55 MM HG(28.88 IN HG)            DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
 RELATIVE HUMIDITY  49. PCT                     ABS. HUMIDITY 10.1 GM/KG
 BAG RESULTS                                                                              NOX HUMIDITY CORRECTION FACTOR   .98
   BAG NUMBER                                         1                 2                    3                   4
   DESCRIPTION                                 COLD TRANSIENT       STABILIZED          HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                685.8 (27.0)       685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)       558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             37.8 (100.0)       33.9 ( 93.0)        39.4 (103.0)        35.0 ( 95.0)
   BLOWER REVOLUTIONS                              13877.             23827.              13864.              23826.
   TOT FLOW STD. CU. METRES(SCF)                132.7 ( 4686.)     229.2 ( 8094.)      132.0 ( 4663.)      228.7 ( 8076.)
   HC  SAMPLE METER/RANGE/PPM                   15.4/11/  15.      11.9/11/  12.       13.8/11/  14.       11.9/11/  12.
   HC  BCKGRD METER/RANGE/PPM                    7.9/ 1/   8.       9.8/ 1/  10.        9.8/ 1/  10.       11.4/ 1/  11.
   CO  SAMPLE METER/RANGE/PPM                   32.4/13/  30.      18.8/13/  17.       28.5/13/  26.       22.2/13/  20.
   CO  BCKGRD METER/RANGE/PPM                    2.3/13/   2.       2.3/13/   2.        6.1/13/   6.        7.0/13/   6.
   CO2 SAMPLE METER/RANGE/PCT                   44.8/ 3/  .77      26.0/ 3/  .43       38.5/ 3/  .65       25.1/ 3/  .41
   CO2 BCKGRD METER/RANGE/PCT                    3.0/ 3/  .05       3.4/ 3/  .05        3.6/ 3/  .06        3.7/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                   24.3/ 2/  24.      14.8/ 2/  15.       23.3/ 2/  23.       14.2/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM                    1.9/ 2/   2.       1.9/ 2/   2.        1.8/ 2/   2.        1.8/ 2/   2.
   DILUTION FACTOR                                  17.35              31.32               20.49               32.48
   HC  CONCENTRATION PPM                             8.                 2.                  5.                  1.
   CO  CONCENTRATION PPM                            27.                15.                 20.                 14.
   CO2 CONCENTRATION PCT                            .72                .37                 .60                 .35
   NOX CONCENTRATION PPM                           22.5               13.0                21.6                12.5
   FILTER WT. MG (EFFICIENCY, %)                 .187 (69.)         .145 (58.)          .137 (76.)          .130 (60.)
   HC  MASS GRAMS                                   .61                .32                 .34                 .12
   CO  MASS GRAMS                                  4.18               3.93                3.11                3.66
   CO2 MASS GRAMS                                1760.4             1572.2              1444.4              1483.8
   NOX MASS GRAMS                                  5.60               5.57                5.35                5.34
   PARTICULATE MASS GRAMS                           .17                .16                 .11                 .14

   HC  GRAMS/KM                                     .11                .05                 .06                 .02
   CO  GRAMS/KM                                     .73                .64                 .54                 .59
   CO2 GRAMS/KM                                   308.3              257.0               251.1               241.1
   NOX GRAMS/KM                                     .98                .91                 .93                 .87
   FUEL CONSUMPTION BY CB L/100KM                 11.52               9.60                9.38                9.00

   RUN TIME               SECONDS                 505.               868.                505.                868.
   MEASURED DISTANCE      KM                      5.71               6.12                5.75                6.16
   SCF, DRY                                       .977       .979    .980                .978       .979     .980
       DFC, WET (DRY)                                  .959( .943)                           .963( .947)
       TOT VOL (SCM) / SAM BLR (SCM)                 362.0/ 75.76                          360.8/ 75.67
       KM  (MEASURED)                                    11.83                                 11.91
       FUEL CONSUMPTION L/100KM                          10.53                                  9.19

COMPOSITE RESULTS
   TEST NUMBER              6130T1
   BAROMETER      MM HG    733.6                                                              3-BAG       (4-BAG)
   HUMIDITY       G/KG      10.1                   CARBON DIOXIDE          G/KM               266.0      ( 261.3)
   TEMPERATURE    DEG C     25.0                   FUEL CONSUMPTION        L/100KM              9.94     (   9.76)
                                                   HYDROCARBONS (THC)      G/KM                 .07      (    .06)
                                                   CARBON MONOXIDE         G/KM                 .63      (    .62)
                                                   OXIDES OF NITROGEN      G/KM                 .93      (    .92)
                                                   PARTICULATES            G/KM                .025      (   .024)
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                        FTP    - VEHICLE EMISSIONS RESULTS -48000 KM WITH TRAP
                                  PROJECT 05-5810-001

TEST NO.   6130T2   RUN   1                     VEHICLE NO.61                           TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                DATE    3/25/82                         ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                      BAG CART NO. 1 / CVS NO.  3             DIESEL     EM-465-F
TRANSMISSION A3                                 DYNO NO.      2                         ODOMETER 60688. KM(37710. MILES)

BAROMETER 742.19 MM HG(29.22 IN HG)             DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
RELATIVE HUMIDITY  35. PCT                      ABS. HUMIDITY  7.9 GM/KG                NOX HUMIDITY CORRECTION FACTOR   .91
BAG RESULTS
   BAG NUMBER                                          1                  2                  3                  4
   DESCRIPTION                                  COLD TRANSIENT       STABILIZED       HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                685.8 (27.0)       685.8 (27.0)       685.8 (27.0)       685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)       558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             37.8 (100.0)       32.2 ( 90.0)       37.8 (100.0)       33.9 ( 93.0)
   BLOWER REVOLUTIONS                              13884.             23833.             13872.             23832.
   TOT FLOW STD. CU. METRES(SCF)                134.6 ( 4752.)     233.2 ( 8236.)     134.4 ( 4747.)     232.4 ( 8205.)
   HC  SAMPLE METER/RANGE/PPM                   16.1/11/  16.       8.4/11/   8.       9.8/11/  10.       8.4/11/   8.
   HC  BCKGRD METER/RANGE/PPM                    5.6/ 1/   6.       6.1/ 1/   6.       6.1/ 1/   6.       6.4/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM                   31.8/13/  29.      16.6/13/  15.      22.7/13/  21.      16.0/13/  15.
   CO  BCKGRD METER/RANGE/PPM                     .7/13/   1.        .9/13/   1.       1.1/13/   1.        .9/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                   44.0/ 3/  .75      25.1/ 3/  .41      37.6/ 3/  .63      24.2/ 3/  .39
   CO2 BCKGRD METER/RANGE/PCT                    2.7/ 3/  .04       2.9/ 3/  .04       2.9/ 3/  .04       2.8/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                   23.9/ 2/  24.      14.7/ 2/  15.      24.1/ 2/  24.      14.3/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM                     .3/ 2/   0.        .9/ 2/   1.        .9/ 2/   1.        .9/ 2/   1.
   DILUTION FACTOR                                 17.70              32.55              21.06              33.84
   HC  CONCENTRATION PPM                            11.                 3.                 4.                 2.
   CO  CONCENTRATION PPM                            28.                14.                19.                13.
   CO2 CONCENTRATION PCT                            .71                .37                .59                .35
   NOX CONCENTRATION PPM                           23.6               13.8               23.2               13.4
   FILTER WT. MG (EFFICIENCY, $)                .208 (80.)         .141 (68.)         .175 (81.)         .123 (64.)
   HC  MASS GRAMS                                   .84                .34                .31                .29
   CO  MASS GRAMS                                  4.38               3.80               3.02               3.64
   CO2 MASS GRAMS                                1758.6             1564.3             1454.9             1498.2
   NOX MASS GRAMS                                  5.56               5.64               5.47               5.46
   PARTICULATE MASS GRAMS                           .16                .13                .14                .12

   HC  GRAMS/KM                                     .15                .06                .05                .05
   CO  GRAMS/KM                                     .76                .62                .53                .59
   CO2 GRAMS/KM                                   306.6              253.9              255.4              243.4
   NOX GRAMS/KM                                     .97                .92                .96                .89
   FUEL CONSUMPTION BY CB L/100KM                 11.47               9.49               9.54               9.10

   RUN TIME              SECONDS                   505.               868.               505.               868.
   MEASURED DISTANCE     KM                        5.74               6.16               5.70               6.15
   SCF, DRY                                        .982       .984    .985               .983       .984    .985
        DFC, WET (DRY)                                     .960( .949)                           .964( .953)
        TOT VOL (SCM) / SAM BLR (SCM)                     367.8/ 77.07                          366.8/ 77.01
        KM  (MEASURED)                                       11.90                                 11.85
        FUEL CONSUMPTION L/100KM                             10.44                                  9.31

COMPOSITE RESULTS                                                                                         3-BAG      (4-BAG)
   TEST NUMBER           6130T2                                 CARBON DIOXIDE       G/KM      265.2      ( 262.1)
   BAROMETER     MM HG   742.2                                  FUEL CONSUMPTION     L/100KM     9.91      (  9.79)
   HUMIDITY      G/KG      7.9                                  HYDROCARBONS (THC)   G/KM         .07      (   .07)
   TEMPERATURE   DEG C    26.7                                  CARBON MONOXIDE      G/KM         .62      (   .62)
                                                                OXIDES OF NITROGEN   G/KM         .94      (   .93)
                                                                PARTICULATES         G/KM        .023      (  .023)
                                  TP   - VEHICLE EMISSIONS RESULTS -56000 KM W/O TRAP
                                          PROJECT 05-5810-001

TEST NO.   6135-1   RUN   1               VEHICLE NO.61                         TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D          DATE     4/16/82                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                BAG CART NO. 1 / CVS NO.  3           DIESEL     EM-465-F
TRANSMISSION A3                           DYNO NO.       2                      ODOMETER 69036. KM(42897. MILES)

BAROMETER 732.79 MM HG(28.85 IN HG)       DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  53. PCT                ABS. HUMIDITY 11.3 GM/KG              NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
   BAG NUMBER                                    1                2                  3                  4
   DESCRIPTION                            COLD TRANSIENT      STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           678.2 (26.7)      685.8 (27.0)       683.3 (26.9)       685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)         546.1 (21.5)      558.8 (22.0)       556.3 (21.9)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)        38.3 (101.0)      34.4 ( 94.0)       36.1 ( 97.0)       34.4 ( 94.0)
   BLOWER REVOLUTIONS                         13831.            23836.             13842.             23800.
   TOT FLOW STD. CU. METRES(SCF)           132.8 ( 4688.)    229.9 ( 8118.)     133.1 ( 4701.)     229.5 ( 8103.)
   HC  SAMPLE METER/RANGE/PPM              17.0/11/  17.     11.8/11/  12.      13.1/11/  13.      11.1/11/  11.
   HC  BCKGRD METER/RANGE/PPM               7.9/ 1/   8.      7.9/ 1/   8.       7.9/ 1/   8.       7.2/ 1/   7.
   CO  SAMPLE METER/RANGE/PPM              29.0/13/  27.     15.7/13/  14.      22.7/13/  21.      14.9/13/  14.
   CO  BCKGRD METER/RANGE/PPM                .3/13/   0.       .1/13/   0.        .1/13/   0.        .3/13/   0.
   CO2 SAMPLE METER/RANGE/PCT              44.4/ 3/  .76     25.7/ 3/  .42      38.9/ 3/  .66      24.7/ 3/  .40
   CO2 BCKGRD METER/RANGE/PCT               2.9/ 3/  .04      3.2/ 3/  .05       3.3/ 3/  .05       3.0/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM              23.1/ 2/  23.     13.3/ 2/  13.      22.3/ 2/  22.      13.4/ 2/  13.
   NOX BCKGRD METER/RANGE/PPM               1.7/ 2/   2.      1.1/ 2/   1.        .8/ 2/   1.        .7/ 2/   1.
   DILUTION FACTOR                             17.53             31.73              20.28              33.10
   HC  CONCENTRATION PPM                       10.               4.                 6.                 4.
   CO  CONCENTRATION PPM                       26.               14.                20.                13.
   CO2 CONCENTRATION PCT                       .72               .37                .61                .36
   NOX CONCENTRATION PPM                      21.5              12.2               21.5               12.7
   FILTER WT. MG (EFFICIENCY, %)           3.269 (99.)       2.575 (96.)        2.418 (98.)        2.323 (97.)
   HC  MASS GRAMS                               .73               .55                .43                .54
   CO  MASS GRAMS                              3.95              3.69               3.10               3.45
   CO2 MASS GRAMS                            1746.1            1567.2             1485.0             1503.5
   NOX MASS GRAMS                              5.57              5.49               5.60               5.70
   PARTICULATE MASS GRAMS                      1.99              1.55               1.49               1.46

   HC  GRAMS/KM                                 .13               .09                .07                .09
   CO  GRAMS/KM                                 .68               .59                .54                .56
   CO2 GRAMS/KM                               300.5             251.4              257.3              242.8
   NOX GRAMS/KM                                 .96               .88                .97                .92
   FUEL CONSUMPTION BY CB L/100KM             11.23              9.39               9.61               9.07

   RUN TIME              SECONDS               504.              867.               504.               867.
   MEASURED DISTANCE     KM                    5.81              6.23               5.77               6.19
   SCF, DRY                                    .976      .978    .979               .977       .978    .979
        DFC, WET (DRY)                               .959( .943)                          .963( .946)
        TOT VOL (SCM) / SAM BLR (SCM)               362.7/ 76.35                         362.6/ 76.24
        KM  (MEASURED)                                 12.05                                11.96
        FUEL CONSUMPTION L/100KM                       10.28                                 9.33

COMPOSITE RESULTS                                                                        3-BAG       (4-BAG)
   TEST NUMBER          6135-1                     CARBON DIOXIDE        G/KM          263.2       ( 260.7)
   BAROMETER     MM HG  732.8                      FUEL CONSUMPTION      L/100KM         9.84      (   9.74)
   HUMIDITY      G/KG    11.3                      HYDROCARBONS (THC)    G/KM            .09       (    .09)
   TEMPERATURE   DEG C   25.6                      CARBON MONOXIDE       G/KM            .60       (    .58)
                                                   OXIDES OF NITROGEN    G/KM            .92       (    .93)
                                                   PARTICULATES          G/KM            .271      (   .267)
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                    FTP   - VEHICLE EMISSIONS RESULTS -56000 KM W/O TRAP
                            PROJECT 05-5810-001

TEST NO.   6135-3   RUN   1                  VEHICLE NO.61                      TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL    80 MERCEDES 300D            DATE     4/20/82                   ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO.  3        DIESEL     EM-465-F
TRANSMISSION A3                              DYNO NO.      2                    ODOMETER 69116. KM(42947. MILES)

BAROMETER 737.36 MM HG(29.03 IN HG)          DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
RELATIVE HUMIDITY  66. PCT                   ABS. HUMIDITY 12.2 GM/KG           NOX HUMIDITY CORRECTION FACTOR  1.05
BAG RESULTS
  BAG NUMBER                                       1                2                 3                 4
  DESCRIPTION                               COLD TRANSIENT     STABILIZED      HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              685.8 (27.0)     685.8 (27.0)      685.8 (27.0)      685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)            558.8 (22.0)     558.8 (22.0)      558.8 (22.0)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           36.1 ( 97.0)     35.6 ( 96.0)      35.6 ( 96.0)      34.4 ( 94.0)
  BLOWER REVOLUTIONS                          13859.           23886.            13879.            23828.
  TOT FLOW STD. CU. METRES(SCF)              134.0 ( 4731.)   231.1 ( 8161.)    134.3 ( 4741.)    231.0 ( 8155.)
  HC  SAMPLE METER/RANGE/PPM                 15.5/11/  15.      9.4/11/   9.     10.0/11/  10.      8.7/11/   9.
  HC  BCKGRD METER/RANGE/PPM                  4.7/ 1/   5.      5.3/ 1/   5.      5.3/ 1/   5.      4.5/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                 30.5/13/  28.     16.8/13/  15.     23.1/13/  21.     16.1/13/  15.
  CO  BCKGRD METER/RANGE/PPM                   .8/13/   1.       .8/13/   1.       .8/13/   1.       .7/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                 44.3/ 3/  .76     24.8/ 3/  .40     37.2/ 3/  .63     23.8/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                  2.9/ 3/  .04      3.2/ 3/  .05      2.8/ 3/  .04      2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                 23.3/ 2/  23.     13.0/ 2/  13.     21.6/ 2/  22.     12.8/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                   .5/ 2/   1.      1.0/ 2/   1.       .7/ 2/   1.       .6/ 2/   1.
  DILUTION FACTOR                               17.57            32.96             21.30             34.44
  HC  CONCENTRATION PPM                         11.               4.                5.                4.
  CO  CONCENTRATION PPM                         26.              14.               20.               14.
  CO2 CONCENTRATION PCT                          .72              .36               .59               .35
  NOX CONCENTRATION PPM                         22.8             12.0              20.9              12.2
  FILTER WT. MG (EFFICIENCY, %)               2.950 (99.)      2.455 (98.)       2.445 (99.)       2.280 (98.)
  HC  MASS GRAMS                                 .85              .56               .38               .57
  CO  MASS GRAMS                                4.11             3.80              3.08              3.65
  CO2 MASS GRAMS                              1757.6           1509.0            1438.6            1466.0
  NOX MASS GRAMS                                6.16             5.60              5.66              5.68
  PARTICULATE MASS GRAMS                        1.81             1.49              1.68              1.43

  HC  GRAMS/KM                                   .15              .09               .07               .09
  CO  GRAMS/KM                                   .71              .61               .53               .58
  CO2 GRAMS/KM                                 303.0            241.5             248.3             233.9
  NOX GRAMS/KM                                  1.06              .90               .98               .91
  FUEL CONSUMPTION BY CB L/100KM               11.33             9.03              9.27              8.74

  RUN TIME              SECONDS                 505.             870.              505.              867.
  MEASURED DISTANCE     KM                      5.80             6.25              5.79              6.27
  SCF, DRY                                      .972     .974     .975              .973      .974    .975
       DFC, WET (DRY)                               .960( .939)                         .964( .944)
       TOT VOL (SCM) / SAM BLR (SCM)               365.1/ 77.41                        365.2/ 77.28
       KM  (MEASURED)                                 12.05                               12.06
       FUEL CONSUMPTION L/100KM                       10.14                                9.00

COMPOSITE RESULTS                                                                          3-BAG     (4-BAG)
  TEST NUMBER              6135-3                    CARBON DIOXIDE        G/KM           256.1     ( 253.8)
  BAROMETER       MM HG    737.4                     FUEL CONSUMPTION      L/100KM         9.57     (  9.49)
  HUMIDITY        G/KG      12.2                     HYDROCARBONS (THC)    G/KM             .10     (   .10)
  TEMPERATURE     DEG C     23.3                     CARBON MONOXIDE       G/KM             .61     (   .60)
                                                     OXIDES OF NITROGEN    G/KM             .95     (   .95)
                                                     PARTICULATES          G/KM            .268     (  .265)
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                                  FTP   - VEHICLE EMISSIONS RESULTS -56000 KM W/TRAP
                                           PROJECT 05-5810-001

TEST NO.   6135T2   RUN   1               VEHICLE NO.61                           TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D           DATE    4/15/82                         ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                 BAG CART NO. 1 / CVS NO.  3             DIESEL     EM-465-F
TRANSMISSION A3                            DYNO NO.      2                         ODOMETER 68993. KM(42870. MILES)

BAROMETER 733.30 MM HG(28.87 IN HG)        DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  57. PCT                 ABS. HUMIDITY 12.6 GM/KG                NOX HUMIDITY CORRECTION FACTOR  1.07
BAG RESULTS
   BAG NUMBER                                   1                   2                   3                   4
   DESCRIPTION                            COLD TRANSIENT       STABILIZED         HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          685.8 (27.0)        685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)        558.8 (22.0)        558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)       37.8 (100.0)        36.1 ( 97.0)        37.8 (100.0)        36.1 ( 97.0)
   BLOWER REVOLUTIONS                        13858.              23825.              13859.              23815.
   TOT FLOW STD. CU. METRES(SCF)          132.7 ( 4684.)      228.6 ( 8070.)      132.6 ( 4684.)      228.4 ( 8066.)
   HC  SAMPLE METER/RANGE/PPM             12.6/11/  13.        7.7/11/   8.        9.9/11/  10.        7.8/11/   8.
   HC  BCKGRD METER/RANGE/PPM              5 7/ 1/   6.        6.3/ 1/   6.        6.3/ 1/   6.        6.1/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM             31.2/13/  29.       17.6/13/  16.       24.5/13/  22.       17.5/13/  16.
   CO  BCKGRD METER/RANGE/PPM              2.0/13/   2.        1.7/13/   2.        1.9/13/   2.        2.0/13/   2.
   CO2 SAMPLE METER/RANGE/PCT             45.4/ 3/  .78       25.7/ 3/  .42       38.6/ 3/  .65       25.1/ 3/  .41
   CO2 BCKGRD METER/RANGE/PCT              3.0/ 3/  .05        3.1/ 3/  .05        3.2/ 3/  .05        3.2/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM             23.5/ 2/  24.       13.5/ 2/  14.       22.4/ 2/  22.       13.8/ 2/  14.
   NOX BCKGRD METER/RANGE/PPM              3.3/ 2/   3.        1.4/ 2/   1.        1.3/ 2/   1.        1.4/ 2/   1.
   DILUTION FACTOR                           17.11               31.74               20.46               32.55
   HC  CONCENTRATION PPM                     7.                  2.                  4.                  2.
   CO  CONCENTRATION PPM                    26.                 14.                 20.                 14.
   CO2 CONCENTRATION PCT                     .74                 .37                 .61                 .36
   NOX CONCENTRATION PPM                    20.4                12.1                21.2                12.4
   FILTER WT. MG (EFFICIENCY, %)          .259 (86.)          .152 (81.)          .191 (79.)          .144 (77.)
   HC  MASS GRAMS                             .56                 .21                 .30                 .24
   CO  MASS GRAMS                            4.03                3.75                3.10                3.66
   CO2 MASS GRAMS                          1787.4              1564.3              1469.7              1513.3
   NOX MASS GRAMS                            5.52                5.66                5.73                5.80
   PARTICULATE MASS GRAMS                     .18                 .12                 .15                 .12

   HC  GRAMS/KM                               .10                 .03                 .05                 .04
   CO  GRAMS/KM                               .70                 .60                 .54                 .59
   CO2 GRAMS/KM                             308.7               251.2               254.5               244.1
   NOX GRAMS/KM                               .95                 .91                 .99                 .94
   FUEL CONSUMPTION BY CB L/100KM           11.53                9.38                9.50                9.12

   RUN TIME              SECONDS            505.                868.                505.                867.
   MEASURED DISTANCE     KM                  5.79                6.23                5.78                6.20
   SCF, DRY                                  .974      .976      .978                .975      .977      .978
      DFC, WET (DRY)                                .959( .941)                             .963( .945)
         TOT VOL (SCM) / SAM BLR (SCM)             361.2/ 76.13                             361.1/ 76.07
         KM  (MEASURED)                               12.02                                    11.98
         FUEL CONSUMPTION L/100KM                     10.42                                     9.30

COMPOSITE RESULTS
   TEST NUMBER           6135T2                                                          3-BAG       (4-BAG)
   BAROMETER     MM HG   733.3                      CARBON DIOXIDE        G/KM           264.0       ( 261.9)
   HUMIDITY      G/KG     12.6                      FUEL CONSUMPTION      L/100KM          9.86      (  9.78)
   TEMPERATURE   DEG C    26.1                      HYDROCARBONS (THC)    G/KM              .05      (   .05)
                                                    CARBON MONOXIDE       G/KM              .60      (   .60)
                                                    OXIDES OF NITROGEN    G/KM              .94      (   .95)
                                                    PARTICULATES          G/KM             .023      (  .023)
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                                   FTP    - VEHICLE EMISSIONS RESULTS -56000 KM W/TRAP
                                              PROJECT 05-5810-001

TEST NO.   6135T1   RUN   1           .VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D       DATE    4/14/82                        ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5             BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-465-F
TRANSMISSION A3                        DYNO NO.      2                        ODOMETER 68960. KM(42850. MILES)

BAROMETER 737.36 MM HG(29.03 IN HG)    DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  67. PCT             ABS. HUMIDITY 13.3 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.09
BAG RESULTS
  BAG NUMBER                                  1              2              3              4
  DESCRIPTION                           COLD TRANSIENT   STABILIZED    HOT TRANSIENT    STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)         685.8 (27.0)   685.8 (27.0)   685.8 (27.0)   685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)       558.8 (22.0)   558.8 (22.0)   558.8 (22.0)   558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)      37.8 (100.0)   35.6 ( 96.0)   37.2 ( 99.0)   35.0 ( 95.0)
  BLOWER REVOLUTIONS                       13858.         23801.         13859.         23819.
  TOT FLOW STD. CU. METRES(SCF)         133.4 ( 4711.) 229.8 ( 8115.) 133.5 ( 4714.) 230.2 ( 8128.)
  HC  SAMPLE METER/RANGE/PPM            11.6/11/  12.   7.4/11/   7.   9.6/11/  10.   7.9/11/   8.
  HC  BCKGRD METER/RANGE/PPM             6.2/ 1/   6.   6.0/ 1/   6.   6.0/ 1/   6.   6.0/ 1/   6.
  CO  SAMPLE METER/RANGE/PPM            33.5/13/  31.  18.9/13/  17.  24.7/13/  23.  18.2/13/  17.
  CO  BCKGRD METER/RANGE/PPM             2.7/13/   2.   2.8/13/   3.   2.4/13/   2.   2.5/13/   2.
  CO2 SAMPLE METER/RANGE/PCT            44.6/ 3/  .76  25.7/ 3/  .42  37.9/ 3/  .64  24.6/ 3/  .40
  CO2 BCKGRD METER/RANGE/PCT             3.1/ 3/  .05   3.0/ 3/  .05   2.6/ 3/  .04   2.9/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM            22.4/ 2/  22.  13.2/ 2/  13.  20.8/ 2/  21.  12.7/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM             1.0/ 2/   1.    .7/ 2/   1.    .7/ 2/   1.    .7/ 2/   1.
  DILUTION FACTOR                           17.44          31.74          20.87          33.25
  HC  CONCENTRATION PPM                      6.             2.             4.             2.
  CO  CONCENTRATION PPM                     28.            14.            20.            14.
  CO2 CONCENTRATION PCT                      .72            .38            .60            .36
  NOX CONCENTRATION PPM                     21.5           12.5           20.1           12.0
  FILTER WT. MG (EFFICIENCY, %)          .174 (85.)     .150 (79.)     .123 (80.)     .129 (76.)
  HC  MASS GRAMS                             .44            .21            .30            .28
  CO  MASS GRAMS                            4.28           3.82           3.08           3.73
  CO2 MASS GRAMS                          1756.7         1579.2         1469.0         1507.1
  NOX MASS GRAMS                            5.97           6.01           5.61           5.77
  PARTICULATE MASS GRAMS                     .12            .12            .10            .11

  HC  GRAMS/KM                               .08            .03            .05            .04
  CO  GRAMS/KM                               .74            .61            .53            .60
  CO2 GRAMS/KM                             303.1          252.0          253.8          242.3
  NOX GRAMS/KM                              1.03            .96            .97            .93
  FUEL CONSUMPTION BY CB L/100KM           11.33           9.41           9.48           9.05

  RUN TIME              SECONDS             505.           867.           505.           868.
  MEASURED DISTANCE     KM                  5.80           6.27           5.79           6.22
  SCF, DRY                                  .971     .973   .975           .973     .974   .975
       DFC, WET (DRY)                             .959( .938)                   .963( .943)
       TOT VOL (SCM) / SAM BLR (SCM)             363.2/ 76.44                  363.7/ 76.47
       KM  (MEASURED)                                12.06                         12.01
       FUEL CONSUMPTION L/100KM                      10.33                          9.26

COMPOSITE RESULTS                                                                          3-BAG      (4-BAG)
  TEST NUMBER            6135T1                          CARBON DIOXIDE        G/KM        263.0      ( 260.2)
  BAROMETER     MM HG   737.4                            FUEL CONSUMPTION      L/100KM      9.82      (  9.72)
  HUMIDITY      G/KG     13.3                            HYDROCARBONS (THC)    G/KM          .05      (   .05)
  TEMPERATURE   DEG C    24.4                            CARBON MONOXIDE       G/KM          .61      (   .61)
                                                         OXIDES OF NITROGEN    G/KM          .98      (   .97)
                                                         PARTICULATES          G/KM         .019      (  .018)
                                   FTP   - VEHICLE EMISSIONS RESULTS -64000 KM W/O TRAP
                                              PROJECT 05-5810-001

TEST NO.   6140-1   RUN   1                         VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                    DATE     5/17/82                     ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                          BAG CART NO. 1 / CVS NO.  3          DIESEL    EM-465-F
TRANSMISSION A3                                     DYNO NO.       2                     ODOMETER 78707. KM(48906. MILES)

BAROMETER 742.19 MM HG(29.22 IN HG)                 DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  60. PCT                          ABS. HUMIDITY 12.7 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.07
BAG RESULTS
  BAG NUMBER                                       1                  2                  3                  4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              685.8 (27.0)       685.8 (27.0)       685.8 (27.0)       685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)            558.8 (22.0)       558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)           37.8 (100.0)       35.0 ( 95.0)       37.8 (100.0)       33.9 ( 93.0)
  BLOWER REVOLUTIONS                            13871.             23834.             13870.             23817.
  TOT FLOW STD. CU. METRES(SCF)              135.1 ( 4770.)     233.0 ( 8226.)     135.1 ( 4769.)     233.3 ( 8238.)
  HC  SAMPLE METER/RANGE/PPM                 12.7/11/  13.      7.7/11/   8.      9.5/11/  10.      7.8/11/   8.
  HC  BCKGRD METER/RANGE/PPM                  3.1/ 1/   3.      4.0/ 1/   4.      4.0/ 1/   4.      4.4/ 1/   4.
  CO  SAMPLE METER/RANGE/PPM                 30.9/13/  28.     18.5/13/  17.     26.8/13/  25.     19.0/13/  17.
  CO  BCKGRD METER/RANGE/PPM                  3.1/13/   3.      3.7/13/   3.      4.0/13/   4.      4.2/13/   4.
  CO2 SAMPLE METER/RANGE/PCT                 43.4/ 3/  .74     25.3/ 3/  .41     37.9/ 3/  .64     24.1/ 3/  .39
  CO2 BCKGRD METER/RANGE/PCT                  2.8/ 3/  .04      3.1/ 3/  .05      3.3/ 3/  .05      3.1/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                 22.6/ 2/  23.     13.6/ 2/  14.     22.5/ 2/  23.     13.4/ 2/  13.
  NOX BCKGRD METER/RANGE/PPM                  1.3/ 2/   1.       .9/ 2/   1.       .9/ 2/   1.      1.0/ 2/   1.
  DILUTION FACTOR                                17.98              32.27              20.87              33.97
  HC  CONCENTRATION PPM                          10.                 4.                 6.                 3.
  CO  CONCENTRATION PPM                          25.                13.                20.                13.
  CO2 CONCENTRATION PCT                           .70                .37                .59                .35
  NOX CONCENTRATION PPM                          21.4               12.7               21.6               12.4
  FILTER WT. MG (EFFICIENCY, $)              2.924 (98.)        2.304 (98.)        2.584 (98.)        2.358 (98.)
  HC  MASS GRAMS                                  .76                .51                .45                .47
  CO  MASS GRAMS                                 3.91               3.58               3.21               3.59
  CO2 MASS GRAMS                               1733.4             1564.7             1460.9             1477.6
  NOX MASS GRAMS                                 5.90               6.06               5.97               5.93
  PARTICULATE MASS GRAMS                         1.82               1.42               1.58               1.46

  HC  GRAMS/KM                                    .13                .08                .08                .08
  CO  GRAMS/KM                                    .68                .58                .56                .58
  CO2 GRAMS/KM                                  300.9              252.7              253.8              238.4
  NOX GRAMS/KM                                   1.02                .98               1.04                .96
  FUEL CONSUMPTION BY CB L/100KM                11.25               9.44               9.48               8.91

  RUN TIME                SECONDS                505.               867.               505.               868.
  MEASURED DISTANCE       KM                     5.76               6.19               5.76               6.20
  SCF, DRY                                        .974      .976     .977               .975      .976     .977
       DFC, WET (DRY)                                   .960( .941)                           .964( .945)
       TOT VOL (SCM) / SAM BLR (SCM)                   368.1/ 77.75                          368.4/ 77.72
       KM  (MEASURED)                                    11.95                                 11.95
       FUEL CONSUMPTION L/100KM                          10.31                                  9.19

COMPOSITE RESULTS                                                                                    3-BAG      (4-BAG)
  TEST NUMBER           6140-1                                    CARBON DIOXIDE        G/KM        263.0      ( 258.8)
  BAROMETER     MM HG   742.2                                     FUEL CONSUMPTION      L/100KM      9.83      (  9.67)
  HUMIDITY      G/KG     12.7                                     HYDROCARBONS (THC)    G/KM          .09      (   .09)
  TEMPERATURE   DEG C    25.6                                     CARBON MONOXIDE       G/KM          .59      (   .59)
                                                                  OXIDES OF NITROGEN    G/KM         1.00      (  1.00)
                                                                  PARTICULATES          G/KM         .259      (  .261)
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                              FTP   - VEHICLE EMISSIONS RESULTS -64000 KM W/O TRAP
                                      PROJECT 05-5810-001

TEST NO.   6140-2   RUN   1
VEHICLE MODEL   80 MERCEDES 300D       VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5             DATE     5/18/82                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                        BAG CART NO. 1 / CVS NO.  3            DIESEL     EM-465-F
                                       DYNO NO.      2                        ODOMETER 77427. KM(48111. MILES)

BAROMETER 741.93 MM HG(29.21 IN HG)    DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  56. PCT             ABS. HUMIDITY 11.4 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
  BAG NUMBER                              1                   2                   3                   4
  DESCRIPTION                       COLD TRANSIENT        STABILIZED        HOT TRANSIENT         STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)      685.8 (27.0)        685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)    558.8 (22.0)        558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)   37.8 (100.0)        33.9 ( 93.0)        35.0 ( 95.0)        35.6 ( 96.0)
  BLOWER REVOLUTIONS                    13884.              23798.              13826.              23858.
  TOT FLOW STD. CU. METRES(SCF)      135.1 ( 4771.)      233.0 ( 8226.)      135.2 ( 4772.)      232.9 ( 8223.)
  HC   SAMPLE METER/RANGE/PPM       15.3/11/  15.        9.8/11/  10.       10.3/11/  10.        9.2/11/   9.
  HC   BCKGRD METER/RANGE/PPM        5.7/ 1/   6.        5.7/ 1/   6.        5.7/ 1/   6.        6.3/ 1/   6.
  CO   SAMPLE METER/RANGE/PPM       36.6/13/  34.       21.8/13/  20.       26.9/13/  25.       19.5/13/  18.
  CO   BCKGRD METER/RANGE/PPM        9.3/13/   8.        7.7/13/   7.        5.8/13/   5.        5.3/13/   5.
  CO2  SAMPLE METER/RANGE/PCT       44.7/ 3/  .77       25.6/ 3/  .42       38.3/ 3/  .65       24.5/ 3/  .40
  CO2  BCKGRD METER/RANGE/PCT        3.2/ 3/  .05        3.2/ 3/  .05        2.7/ 3/  .04        3.2/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM       24.1/ 2/  24.       14.3/ 2/  14.       24.2/ 2/  24.       14.4/ 2/  14.
  NOX  BCKGRD METER/RANGE/PPM        1.3/ 2/   1.        1.1/ 2/   1.        1.2/ 2/   1.        1.3/ 2/   1.
  DILUTION FACTOR                       17.39               31.83               20.63               33.37
  HC   CONCENTRATION PPM                10.                  4.                  5.                  3.
  CO   CONCENTRATION PPM                25.                 13.                 19.                 13.
  CO2  CONCENTRATION PCT                .72                 .37                 .61                 .35
  NOX  CONCENTRATION PPM                22.9                13.2                23.1                13.1
  FILTER WT. MG (EFFICIENCY, %)      3.085 (98.)         2.417 (97.)         2.539 (98.)         2.320 (97.)
  HC   MASS GRAMS                       .77                 .58                 .38                 .42
  CO   MASS GRAMS                      3.94                3.46                2.99                3.45
  CO2  MASS GRAMS                    1780.2              1580.7              1501.9              1498.1
  NOX  MASS GRAMS                      6.05                6.03                6.10                5.99
  PARTICULATE MASS GRAMS               1.94                1.49                1.57                1.45

  HC   GRAMS/KM                         .13                 .09                 .07                 .07
  CO   GRAMS/KM                         .68                 .55                 .51                 .55
  CO2  GRAMS/KM                       307.3               252.4               258.5               238.2
  NOX  GRAMS/KM                        1.04                 .96                1.05                 .95
  FUEL CONSUMPTION BY CB L/100KM      11.49                9.43                9.65                8.90

  RUN TIME               SECONDS       505.                866.                505.                869.
  MEASURED DISTANCE      KM            5.79                6.26                5.81                6.29
  SCF, DRY                             .975       .977     .978                .976       .977     .978
      DFC, WET (DRY)                          .959( .942)                            .963( .946)
      TOT VOL (SCM) / SAM BLR (SCM)          368.1/ 77.57                           368.0/ 77.55
      KM  (MEASURED)                             12.06                                  12.10
      FUEL CONSUMPTION L/100KM                   10.42                                   9.26

COMPOSITE RESULTS
  TEST NUMBER             6140-2                                                  3-BAG      (4-BAG)
  BARometer     MM HG     741.9              CARBON DIOXIDE        G/KM           265.4     ( 261.2)
  HUMIDITY      G/KG       11.4              FUEL CONSUMPTION      L/100KM          9.92     (  9.76)
  TEMPERATURE   DEG C      25.0              HYDROCARBONS (THC)    G/KM             .09     (   .09)
                                             CARBON MONOXIDE       G/KM             .57     (   .57)
                                             OXIDES OF NITROGEN    G/KM            1.00     (  1.00)
                                             PARTICULATES          G/KM            .267     (  .265)
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                                        CFTP  - VEHICLE EMISSIONS RESULTS -64000 KM WITH TRAP
                                                   PROJECT 05-5810-001

TEST NO.   6140T1    RUN   1                    VEHICLE NO.61                          TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                DATE     5/13/82                       ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                      BAG CART NO. 1 / CVS NO.  3            DIESEL     EM-465-F
TRANSMISSION A3                                 DYNO NO.       2                       ODOMETER 77324. KM(48047. MILES)

BAROMETER 734.31 MM HG(28.91 IN HG)             DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  53. PCT                      ABS. HUMIDITY 11.3 GM/KG               NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
   BAG NUMBER                                          1                  2                  3                  4
   DESCRIPTION                                   COLD TRANSIENT       STABILIZED       HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)                685.8 (27.0)       685.8 (27.0)       685.8 (27.0)       685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)       558.8 (22.0)       558.8 (22.0)       558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)             36.1 ( 97.0)       33.9 ( 93.0)       36.1 ( 97.0)       33.9 ( 93.0)
   BLOWER REVOLUTIONS                              13880.             23837.             13874.             23794.
   TOT FLOW STD. CU. METRES(SCF)                133.8 ( 4724.)     230.7 ( 8144.)     133.7 ( 4722.)     230.2 ( 8129.)
   HC  SAMPLE METER/RANGE/PPM                   10.9/11/  11.       5.2/11/   5.       7.4/11/   7.       4.8/11/   5.
   HC  BCKGRD METER/RANGE/PPM                    3.7/ 1/   4.       3.1/ 1/   3.       3.1/ 1/   3.       3.1/ 1/   3.
   CO  SAMPLE METER/RANGE/PPM                   32.3/13/  30.      16.6/13/  15.      23.8/13/  22.      16.0/13/  15.
   CO  BCKGRD METER/RANGE/PPM                     .8/13/   1.        .6/13/   1.        .6/13/   1.        .5/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                   45.4/ 3/  .78      25.2/ 3/  .41      37.8/ 3/  .64      24.3/ 3/  .40
   CO2 BCKGRD METER/RANGE/PCT                    2.8/ 3/  .04       2.7/ 3/  .04       2.7/ 3/  .04       2.4/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                   26.5/ 2/  27.      14.1/ 2/  14.      21.5/ 2/  22.      12.7/ 2/  13.
   NOX BCKGRD METER/RANGE/PPM                   10.1/ 2/  10.       2.5/ 2/   3.       1.7/ 2/   2.        .9/ 2/   1.
   DILUTION FACTOR                                 17.11              32.44              20.94              33.73
   HC  CONCENTRATION PPM                            7.                 2.                 4.                 2.
   CO  CONCENTRATION PPM                           28.                14.                21.                14.
   CO2 CONCENTRATION PCT                            .74                .37                .60                .36
   NOX CONCENTRATION PPM                          17.0               11.7               19.9               11.8
   FILTER WT. MG (EFFICIENCY, %)               .249 (79.)         .247 (75.)         .165 (79.)         .159 (74.)
   HC  MASS GRAMS                                   .58                .30                .35                .23
   CO  MASS GRAMS                                  4.38               3.81               3.21               3.68
   CO2 MASS GRAMS                               1809.8             1567.0             1463.3             1516.9
   NOX MASS GRAMS                                  4.44               5.26               5.19               5.31
   PARTICULATE MASS GRAMS                           .19                .20                .12                .13

   HC  GRAMS/KM                                     .10                .05                .06                .04
   CO  GRAMS/KM                                     .75                .61                .55                .59
   CO2 GRAMS/KM                                   311.6              250.3              252.5              242.4
   NOX GRAMS/KM                                     .76                .84                .90                .85
   FUEL CONSUMPTION BY CB L/100KM                 11.65               9.35               9.43               9.06

   RUN TIME              SECONDS                  505.               868.               505.               867.
   MEASURED DISTANCE     KM                       5.81               6.26               5.80               6.26
   SCF, DRY                                       .976      .978     .979               .977      .978     .979
        DFC, WET (DRY)                                   .959( .943)                          .964( .947)
        TOT VOL (SCM) / SAM BLR (SCM)                   364.5/ 76.50                         364.0/ 76.37
        KM  (MEASURED)                                      12.07                                12.05
        FUEL CONSUMPTION L/100KM                            10.46                                 9.24

COMPOSITE RESULTS                                                                                3-BAG       (4-BAG)
   TEST NUMBER          6140T1                                CARBON DIOXIDE         G/KM       263.6       ( 261.3)
   BAROMETER     MM HG  734.3                                 FUEL CONSUMPTION       L/100KM      9.85       (  9.76)
   HUMIDITY      G/KG    11.3                                 HYDROCARBONS (THC)     G/KM         .06       (   .06)
   TEMPERATURE   DEG C   25.6                                 CARBON MONOXIDE        G/KM         .62       (   .62)
                                                              OXIDES OF NITROGEN     G/KM         .84       (   .84)
                                                              PARTICULATES           G/KM        .029       (  .026)
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                                     FTP   - VEHICLE EMISSIONS RESULTS -64000 KM W/TRAP
                                              PROJECT 05-5810-001

TEST NO.   6140T2   RUN   1                   VEHICLE NO.61                             TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D              DATE    5/14/82                           ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                    BAG CART NO. 1 / CVS NO.  3               DIESEL     EM-465-F
TRANSMISSION A3                               DYNO NO.       2                          ODOMETER 77360. KM(48069. MILES)

BAROMETER 739.39 MM HG(29.11 IN HG)           DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  53. PCT                    ABS. HUMIDITY 10.7 GM/KG                  NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
   BAG NUMBER                                       1                   2                    3                    4
   DESCRIPTION                                COLD TRANSIENT       STABILIZED         HOT TRANSIENT         STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              685.8 (27.0)        685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)            558.8 (22.0)        558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)           37.8 (100.0)        32.2 ( 90.0)        36.7 ( 98.0)        35.0 ( 95.0)
   BLOWER REVOLUTIONS                            13870.              23808.              13852.              23835.
   TOT FLOW STD. CU. METRES(SCF)              134.4 ( 4747.)      232.9 ( 8225.)      134.4 ( 4747.)      231.9 ( 8188.)
   HC  SAMPLE METER/RANGE/PPM                 10.2/11/  10.        5.9/11/  6.         8.5/11/  8.         6.2/11/  6.
   HC  BCKGRD METER/RANGE/PPM                  4.4/ 1/   4.        4.0/ 1/  4.         4.0/ 1/  4.         4.0/ 1/  4.
   CO  SAMPLE METER/RANGE/PPM                 35.3/13/  33.       20.3/13/  18.       27.2/13/  25.       19.1/13/  17.
   CO  BCKGRD METER/RANGE/PPM                  4.8/13/   4.        4.5/13/  4.         3.8/13/  3.         3.7/13/  3.
   CO2 SAMPLE METER/RANGE/PCT                 45.4/ 3/  .78       25.5/ 3/  .42       38.3/ 3/  .65       24.5/ 3/  .40
   CO2 BCKGRD METER/RANGE/PCT                  2.9/ 3/  .04        3.1/ 3/  .05        2.6/ 3/  .04        3.0/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM                 22.1/ 2/  22.       12.8/ 2/  13.       21.0/ 2/  21.       12.5/ 2/  13.
   NOX BCKGRD METER/RANGE/PPM                  1.6/ 2/   2.         .7/ 2/   1.         .6/ 2/   1.         .5/ 2/   1.
   DILUTION FACTOR                               17.11               32.00               20.63               33.40
   HC  CONCENTRATION PPM                          6.                  2.                  5.                  2.
   CO  CONCENTRATION PPM                         28.                 14.                 21.                 14.
   CO2 CONCENTRATION PCT                          .74                 .37                 .61                 .35
   NOX CONCENTRATION PPM                         20.6                12.1                20.4                12.0
   FILTER WT. MG (EFFICIENCY, %)               .721 (92.)          .182 (73.)          .178 (77.)          .166 (76.)
   HC  MASS GRAMS                                 .47                 .27                 .36                 .31
   CO  MASS GRAMS                                4.32                3.84                3.29                3.72
   CO2 MASS GRAMS                              1814.8              1579.5              1497.4              1504.5
   NOX MASS GRAMS                                5.30                5.40                5.25                5.33
   PARTICULATE MASS GRAMS                         .49                 .15                 .14                 .13

   HC  GRAMS/KM                                   .08                 .04                 .06                 .05
   CO  GRAMS/KM                                   .75                 .62                 .57                 .60
   CO2 GRAMS/KM                                 315.3               253.9               260.0               241.5
   NOX GRAMS/KM                                   .92                 .87                 .91                 .86
   FUEL CONSUMPTION BY CB L/100KM               11.78                9.48                9.71                9.03

   RUN TIME                 SECONDS             505.                867.                505.                868.
   MEASURED DISTANCE        KM                  5.76                6.22                5.76                6.23
   SCF, DRY                                     .976      .978      .979                .977      .978      .979
        DFC, WET (DRY)                                .959( .943)                             .963( .947)
        TOT VOL (SCM) / SAM BLR (SCM)               367.4/ 77.06                            366.3/ 77.05
        KM  (MEASURED)                                  11.98                                   11.99
        FUEL CONSUMPTION L/100KM                        10.59                                    9.35

COMPOSITE RESULTS
   TEST NUMBER              6140T2                                                               3-BAG        (4-BAG)
   BAROMETER       MM HG     739.4                      CARBON DIOXIDE          G/KM            268.2       ( 264.6)
   HUMIDITY        G/KG       10.7                      FUEL CONSUMPTION        L/100KM         10.02       (   9.88)
   TEMPERATURE     DEG C      25.0                      HYDROCARBONS (THC)      G/KM              .06       (    .06)
                                                        CARBON MONOXIDE         G/KM              .63       (    .63)
                                                        OXIDES OF NITROGEN      G/KM              .89       (    .89)
                                                        PARTICULATES            G/KM             .037       (   .036)
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                          FTP   - VEHICLE EMISSIONS RESULTS -72000 KM W/O TRAP
                                  PROJECT 05-5810-001

TEST NO.   6145-1   RUN   1                         VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                    DATE    6/11/82                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                          BAG CART NO. 1 / CVS NO. 17          DIESEL    EM-465-F
TRANSMISSION A3                                     DYNO NO.       2                     ODOMETER 86813. KM(53943. MILES)

BAROMETER 741.93 MM HG(29.21 IN HG)                 DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  60. PCT                          ABS. HUMIDITY 12.2 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.05
BAG RESULTS
  BAG NUMBER                                             1                 2                  3                 4
  DESCRIPTION                                      COLD TRANSIENT      STABILIZED        HOT TRANSIENT      STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                    914.4 (36.0)      914.4 (36.0)      914.4 (36.0)      914.4 (36.0)
  BLOWER INLET P MM. H2O(IN. H2O)                  889.0 (35.0)      889.0 (35.0)      889.0 (35.0)      889.0 (35.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)                 45.0 (113.0)      43.9 (111.0)      40.6 (105.0)      41.1 (106.0)
  BLOWER REVOLUTIONS                                  4989.             8584.             4988.             8581.
  TOT FLOW STD. CU. METRES(SCF)                    144.5 ( 5104.)    249.3 ( 8801.)    146.0 ( 5155.)    250.8 ( 8857.)
  HC  SAMPLE METER/RANGE/PPM                       12.7/11/  13.      8.8/11/   9.     10.5/11/  11.      8.0/11/   8.
  HC  BCKGRD METER/RANGE/PPM                        5.8/ 1/   6.      5.2/ 1/   5.      5.2/ 1/   5.      5.0/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                       28.2/13/  26.     16.2/13/  15.     23.9/13/  22.     16.5/13/  15.
  CO  BCKGRD METER/RANGE/PPM                        2.1/13/   2.      1.6/13/   1.      1.4/13/   1.      2.8/13/   3.
  CO2 SAMPLE METER/RANGE/PCT                       39.3/ 3/  .66     22.8/ 3/  .37     33.6/ 3/  .56     21.7/ 3/  .35
  CO2 BCKGRD METER/RANGE/PCT                        2.5/ 3/  .04      2.8/ 3/  .04      2.9/ 3/  .04      2.9/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                       20.1/ 2/  20.     11.7/ 2/  12.     18.3/ 2/  18.     10.9/ 2/  11.
  NOX BCKGRD METER/RANGE/PPM                        1.5/ 2/   2.      1.1/ 2/   1.       .6/ 2/   1.       .5/ 2/   1.
  DILUTION FACTOR                                     20.04             36.04             23.78             37.97
  HC   CONCENTRATION PPM                               7.                4.                6.                3.
  CO   CONCENTRATION PPM                              23.               13.               20.               12.
  CO2 CONCENTRATION PCT                                .63               .33               .52               .31
  NOX CONCENTRATION PPM                               18.7              10.6              17.7              10.4
  FILTER WT. MG (EFFICIENCY, $)                    2.933 (98.)       2.398 (97.)       2.438 (99.)       2.287 (98.)
  HC   MASS GRAMS                                      .60               .54               .46               .45
  CO   MASS GRAMS                                     3.92              3.75              3.40              3.56
  CO2 MASS GRAMS                                    1663.1            1496.3            1384.1            1411.8
  NOX MASS GRAMS                                      5.42              5.32              5.20              5.24
  PARTICULATE MASS GRAMS                              1.96              1.59              1.64              1.51

  HC   GRAMS/KM                                        .10               .09               .08               .07
  CO   GRAMS/KM                                        .67               .60               .58               .56
  CO2 GRAMS/KM                                       286.0             237.8             237.4             224.2
  NOX GRAMS/KM                                         .93               .85               .89               .83
  FUEL CONSUMPTION BY CB L/100KM                     10.69              8.89              8.87              8.38

  RUN TIME               SECONDS                     505.              868.              505.              868.
  MEASURED DISTANCE      KM                           5.82              6.29              5.83              6.30
  SCF, DRY                                            .975      .976     .977              .976      .977     .977
      DFC, WET (DRY)                                       .964( .946)                          .968( .949)
      TOT VOL (SCM) / SAM BLR (SCM)                       393.8/ 76.76                        396.8/ 76.79
      KM  (MEASURED)                                         12.11                               12.13
      FUEL CONSUMPTION L/100KM                                9.75                                8.62

COMPOSITE RESULTS                                                                                 3-BAG      (4-BAG)
  TEST NUMBER             6145-1                              CARBON DIOXIDE          G/KM        247.6      ( 243.6)
  BAROMETER      MM HG   741.9                                FUEL CONSUMPTION        L/100KM       9.26     (   9.11)
  HUMIDITY       G/KG     12.2                                HYDROCARBONS (THC)      G/KM          .09      (    .08)
  TEMPERATURE    DEG C    25.0                                CARBON MONOXIDE         G/KM          .61      (    .60)
                                                              OXIDES OF NITROGEN      G/KM          .88      (    .87)
                                                              PARTICULATES            G/KM          .278     (   .274)
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                                   FTP   - VEHICLE EMISSIONS RESULTS -72000 KM W/O TRAP
                                            PROJECT 05-5810-001
TEST NO.   6145-2   RUN   1
VEHICLE MODEL   80 MERCEDES 300D          VEHICLE NO.61
ENGINE 3.0 L(183. CID) L-5                DATE    6/14/82                     TEST WEIGHT  1814. KG( 4000. LBS)
TRANSMISSION A3                           BAG CART NO. 1 / CVS NO. 17         ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
                                          DYNO NO.      2                     DIESEL    EM-487-F
                                                                              ODOMETER 86129. KM(53518. MILES)
BAROMETER 741.93 MM HG(29.21 IN HG)
RELATIVE HUMIDITY  78. PCT                DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
BAG RESULTS                               ABS. HUMIDITY 13.9 GM/KG
   BAG NUMBER                                                                 NOX HUMIDITY CORRECTION FACTOR  1.12
   DESCRIPTION                                  1                  2                  3                  4
                                         COLD TRANSIENT      STABILIZED       HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          914.4 (36.0)       914.4 (36.0)       914.4 (36.0)       914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)        889.0 (35.0)       889.0 (35.0)       889.0 (35.0)       889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)       39.4 (103.0)       39.4 (103.0)       40.0 (104.0)       39.4 (103.0)
   BLOWER REVOLUTIONS                      4988.              8573.              4983.              8572.
   TOT FLOW STD. CU. METRES(SCF)          146.9 ( 5186.)     252.4 ( 8914.)     146.5 ( 5174.)     252.4 ( 8913.)
   HC   SAMPLE METER/RANGE/PPM            15.7/11/  16.      10.5/11/  10.      11.9/11/  12.      10.0/11/  10.
   HC   BCKGRD METER/RANGE/PPM             9.0/ 1/   9.       7.0/ 1/   7.       7.0/ 1/   7.       7.0/ 1/   7.
   CO   SAMPLE METER/RANGE/PPM            30.1/13/  28.      15.6/13/  14.      23.8/13/  22.      15.3/13/  14.
   CO   BCKGRD METER/RANGE/PPM             1.9/13/   2.       1.6/13/   1.       1.7/13/   2.       2.0/13/   2.
   CO2  SAMPLE METER/RANGE/PCT            40.1/ 3/  .68      22.4/ 3/  .36      33.9/ 3/  .57      21.5/ 3/  .35
   CO2  BCKGRD METER/RANGE/PCT             2.7/ 3/  .04       2.6/ 3/  .04       2.6/ 3/  .04       2.6/ 3/  .04
   NOX  SAMPLE METER/RANGE/PPM            20.6/ 2/  21.      12.2/ 2/  12.      20.1/ 2/  20.      11.9/ 2/  12.
   NOX  BCKGRD METER/RANGE/PPM             1.8/ 2/   2.       1.4/ 2/   1.       1.5/ 2/   2.       1.5/ 2/   2.
   DILUTION FACTOR                            19.60              36.71              23.55              38.34
   HC   CONCENTRATION PPM                      7.                 4.                 5.                 3.
   CO   CONCENTRATION PPM                     25.                12.                20.                12.
   CO2  CONCENTRATION PCT                      .64                .32                .53                .31
   NOX  CONCENTRATION PPM                     18.9               10.8               18.7               10.4
   FILTER WT. MG (EFFICIENCY, %)           2.863 (98.)        2.217 (98.)        2.379 (98.)        2.144 (98.)
   HC   MASS GRAMS                              .61                .53                .44                .46
   CO   MASS GRAMS                             4.28               3.62               3.33               3.44
   CO2  MASS GRAMS                          1722.1             1497.3             1415.7             1425.6
   NOX  MASS GRAMS                             5.93               5.84               5.84               5.63
   PARTICULATE MASS GRAMS                      1.98               1.47               1.66               1.42

   HC   GRAMS/KM
   CO   GRAMS/KM                                .10                .08                .08                .07
   CO2  GRAMS/KM                                .74                .58                .57                .55
   NOX  GRAMS/KM                              297.1              238.1              243.9              226.7
   FUEL CONSUMPTION BY CB L/100KM              1.02                .93               1.01                .89
                                              11.11               8.90               9.12               8.47
   RUN TIME                  SECONDS
   MEASURED DISTANCE         KM               505.               867.               504.               867.
   SCF, DRY                                   5.80               6.29               5.80               6.29
        DFC, WET (DRY)                        .969      .970     .972               .970      .971     .972
        TOT VOL (SCM) / SAM BLR (SCM)             .964( .940)                           .968( .944)
        KM  (MEASURED)                            399.3/ 77.88                          399.0/ 77.83
        FUEL CONSUMPTION L/100KM                     12.08                                 12.09
                                                      9.96                                  8.78
COMPOSITE RESULTS
   TEST NUMBER              6145-2
   BAROMETER      MM HG     741.9                                                     3-BAG      (4-BAG)
   HUMIDITY       G/KG       13.9             CARBON DIOXIDE        G/KM              251.9     ( 248.5)
   TEMPERATURE    DEG C      22.8             FUEL CONSUMPTION      L/100KM             9.41     (   9.29)
                                              HYDROCARBONS (THC)    G/KM                .09     (    .08)
                                              CARBON MONOXIDE       G/KM                .61     (    .60)
                                              OXIDES OF NITROGEN    G/KM                .97     (    .96)
                                              PARTICULATES          G/KM               .270     (   .268)
                                          FTP   - VEHICLE EMISSIONS RESULTS -72000 KM W/TRAP
                                                  PROJECT 05-5810-001

TEST NO.   6145T2   RUN   1                  VEHICLE NO.61                                  TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE     6/10/82                               ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO. 17                    DIESEL    EM-465-F
TRANSMISSION A3                              DYNO NO.      2                                ODOMETER 86040. KM(53463. MILES)

BAROMETER 742.95 MM HG(29.25 IN HG)          DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  56. PCT                   ABS. HUMIDITY 11.4 GM/KG                       NOX HUMIDITY CORRECTION FACTOR  1.02
BAG RESULTS
  BAG NUMBER                                      1                  2                   3                   4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED         HOT TRANSIENT        STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             914.4 (36.0)        914.4 (36.0)        914.4 (36.0)        914.4 (36.0)
  BLOWER INLET P MM. H2O(IN. H2O)           889.0 (35.0)        889.0 (35.0)        889.0 (35.0)        889.0 (35.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          40.6 (105.0)        40.0 (104.0)        38.9 (102.0)        39.4 (103.0)
  BLOWER REVOLUTIONS                           4996.               8572.               4989.               8576.
  TOT FLOW STD. CU. METRES(SCF)             146.6 ( 5175.)      251.8 ( 8891.)      147.0 ( 5189.)      252.2 ( 8906.)
  HC   SAMPLE METER/RANGE/PPM                8.5/11/   9.        8.3/11/   8.       10.0/11/  10.       10.9/11/  11.
  HC   BCKGRD METER/RANGE/PPM                7.2/ 1/   7.        6.6/ 1/   7.        6.6/ 1/   7.        6.0/ 1/   6.
  CO   SAMPLE METER/RANGE/PPM               30.4/13/  28.       17.3/13/  16.       24.0/13/  22.       16.6/13/  15.
  CO   BCKGRD METER/RANGE/PPM                2.0/13/   2.        2.0/13/   2.        1.9/13/   2.        1.9/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                40.7/ 3/  .69       23.7/ 3/  .39       34.8/ 3/  .58       22.6/ 3/  .37
  CO2 BCKGRD METER/RANGE/PCT                 3.4/ 3/  .05        3.3/ 3/  .05        3.1/ 3/  .05        3.2/ 3/  .05
  NOX SAMPLE METER/RANGE/PPM                19.9/ 2/  20.       11.9/ 2/  12.       19.5/ 2/  20.       11.6/ 2/  12.
  NOX BCKGRD METER/RANGE/PPM                 1.5/ 2/   2.        1.0/ 2/   1.        1.1/ 2/   1.        1.0/ 2/   1.
  DILUTION FACTOR                              19.30               34.59               22.90               36.35
  HC   CONCENTRATION PPM                         2.                  2.                  4.                  5.
  CO   CONCENTRATION PPM                        25.                 14.                 20.                 13.
  CO2 CONCENTRATION PCT                         .64                 .34                 .54                 .32
  NOX CONCENTRATION PPM                        18.5                10.9                18.4                10.6
  FILTER WT. MG (EFFICIENCY, %)             .220 (72.)          .179 (74.)          .153 (72.)          .205 (81.)
  HC   MASS GRAMS                               .15                 .27                 .32                 .74
  CO   MASS GRAMS                              4.33                3.98                3.37                3.83
  CO2 MASS GRAMS                             1721.0              1548.7              1444.1              1470.4
  NOX MASS GRAMS                               5.30                5.38                5.30                5.24
  PARTICULATE MASS GRAMS                        .20                 .16                 .14                 .17

  HC   GRAMS/KM                                 .03                 .04                 .05                 .12
  CO   GRAMS/KM                                 .75                 .64                 .58                 .61
  CO2 GRAMS/KM                                297.2               247.6               248.3               234.0
  NOX GRAMS/KM                                  .91                 .86                 .91                 .83
  FUEL CONSUMPTION BY CB L/100KM              11.10                9.25                9.27                8.75

  RUN TIME                   SECONDS           505.                867.                506.                868.
  MEASURED DISTANCE          KM                5.79                6.26                5.82                6.29
  SCF, DRY                                     .976                .978                .977                .979
      DFC, WET (DRY)                                    .977                                 .978
      TOT VOL (SCM) / SAM BLR (SCM)                 .963( .945)                          .967( .949)
      KM  (MEASURED)                               398.4/ 76.83                         399.2/ 76.77
      FUEL CONSUMPTION L/100KM                        12.05                                12.10
                                                      10.14                                 9.00
COMPOSITE RESULTS
  TEST NUMBER              6145T2
  BAROMETER      MM HG      743.0                                                   3-BAG      (4-BAG)
  HUMIDITY       G/KG        11.4              CARBON DIOXIDE         G/KM          258.0     ( 254.0)
  TEMPERATURE    DEG C       25.0              FUEL CONSUMPTION       L/100KM        9.64     (  9.49)
                                               HYDROCARBONS (THC)     G/KM            .04     (   .06)
                                               CARBON MONOXIDE        G/KM            .64     (   .64)
                                               OXIDES OF NITROGEN     G/KM            .89     (   .88)
                                               PARTICULATES           G/KM           .027     (  .027)
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                                FTP   - VEHICLE EMISSIONS RESULTS -72000 KM W/TRAP
                                         PROJECT 05-5810-001

TEST NO.   6145T1   RUN   1                  VEHICLE NO.61                        TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D             DATE    6/ 9/82                      ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                   BAG CART NO. 1 / CVS NO. 17          DIESEL    EM-465-F
TRANSMISSION A3                              DYNO NO.      2                      ODOMETER 86011. KM(53445. MILES)

BAROMETER 740.66 MM HG(29.16 IN HG)          DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
RELATIVE HUMIDITY  59. PCT                   ABS. HUMIDITY 11.7 GM/KG             NOX HUMIDITY CORRECTION FACTOR  1.03
BAG RESULTS
  BAG NUMBER                                      1                  2                  3                  4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              927.1 (36.5)       927.1 (36.5)       927.1 (36.5)       927.1 (36.5)
  BLOWER INLET P MM. H2O(IN. H2O)            901.7 (35.5)       901.7 (35.5)       901.7 (35.5)       901.7 (35.5)
  BLOWER INLET TEMP. DEG. C(DEG. F)           38.3 (101.0)       38.9 (102.0)       37.2 ( 99.0)       38.3 (101.0)
  BLOWER REVOLUTIONS                              4992.              8579.              4990.              8563.
  TOT FLOW STD. CU. METRES(SCF)              146.5 ( 5174.)     251.5 ( 8880.)     146.9 ( 5185.)     251.3 ( 8875.)
  HC   SAMPLE METER/RANGE/PPM                 9.8/11/  10.       6.8/11/   7.       8.4/11/   8.       6.7/11/   7.
  HC   BCKGRD METER/RANGE/PPM                 5.9/ 1/   6.       5.5/ 1/   6.       5.5/ 1/   6.       5.1/ 1/   5.
  CO   SAMPLE METER/RANGE/PPM                27.3/13/  25.      14.7/13/  13.      22.6/13/  21.      15.7/13/  14.
  CO   BCKGRD METER/RANGE/PPM                 1.3/13/   1.       1.4/13/   1.       1.8/13/   2.       2.1/13/   2.
  CO2 SAMPLE METER/RANGE/PCT                 40.5/ 3/  .69      22.9/ 3/  .37      33.7/ 3/  .56      22.0/ 3/  .36
  CO2 BCKGRD METER/RANGE/PCT                  2.8/ 3/  .04       2.7/ 3/  .04       2.5/ 3/  .04       2.6/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                 20.2/ 2/  20.      12.2/ 2/  12.      19.1/ 2/  19.      11.8/ 2/  12.
  NOX BCKGRD METER/RANGE/PPM                   .6/ 2/   1.        .9/ 2/   1.       1.0/ 2/   1.       1.2/ 2/   1.
  DILUTION FACTOR                                19.41              35.91              23.72              37.45
  HC   CONCENTRATION PPM                          4.                 1.                 3.                 2.
  CO   CONCENTRATION PPM                         23.                12.                18.                12.
  CO2 CONCENTRATION PCT                          .65                .33                .53                .32
  NOX CONCENTRATION PPM                         19.6               11.3               18.1               10.6
  FILTER WT. MG (EFFICIENCY, %)              .214 (74.)         .181 (76.)         .141 (76.)         .143 (77.)
  HC   MASS GRAMS                                .36                .21                .27                .25
  CO   MASS GRAMS                               3.94               3.45               3.16               3.53
  CO2 MASS GRAMS                              1734.3             1524.6             1413.0             1459.1
  NOX MASS GRAMS                                5.68               5.63               5.26               5.28
  PARTICULATE MASS GRAMS                         .19                .15                .12                .12

  HC   GRAMS/KM                                  06                 .03                .05                .04
  CO   GRAMS/KM                                  .68                .55                .54                56
  CO2 GRAMS/KM                                 297.9              242.2              241.9              232.7
  NOX GRAMS/KM                                   .98                89                 .90                .84
  FUEL CONSUMPTION BY CB L/100KM               11.13               9.04               9.03               8.69

  RUN TIME                 SECONDS              505.               868.               505.               867.
  MEASURED DISTANCE        KM                   5.82               6.29               5.84               6.27
  SCF, DRY                                      975      .976      .977               .976      .977     .978
       DFC, WET (DRY)                                 963( .945)                           .968( .949)
       TOT VOL (SCM) / SAM BLR (SCM)                398.0/ 76.91                         398.2/ 76.80
       KM  (MEASURED)                                  12.12                                12.11
       FUEL CONSUMPTION L/100KM                        10.05                                 8.86

COMPOSITE RESULTS                                                                                       3-BAG       (4-BAG)
   TEST NUMBER            6145T1                                   CARBON DIOXIDE         G/KM          253.6      ( 250.8)
   BAROMETER     MM HG    740.7                                    FUEL CONSUMPTION       L/100KM        9.47      (  9.37)
   HUMIDITY      G/KG      11.7                                    HYDROCARBONS (THC)     G/KM           .04       (   .04)
   TEMPERATURE   DEG C     24.4                                    CARBON MONOXIDE        G/KM           .57       (   .58)
                                                                   OXIDES OF NITROGEN     G/KM           .91       (   .90)
                                                                   PARTICULATES           G/KM           .025      (  .024)
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                                            FTP   - VEHICLE EMISSIONS RESULTS -80000 KM W/O TRAP
                                                     PROJECT 05-5810-001

TEST NO.   6150-1    RUN   1                  VEHICLE NO.61
VEHICLE MODEL    80 MERCEDES 300D             DATE     7/ 9/82                          TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                    BAG CART NO. 1 / CVS NO. 17              ACTUAL ROAD LOAD    9.7 KW( 13.0 HP)
TRANSMISSION A3                               DYNO NO.      2                          DIESEL     EM-465-F
                                                                                       ODOMETER 94584. KM(58772. MILES)
BAROMETER 742.44 MM HG(29.23 IN HG)
RELATIVE HUMIDITY   56. PCT                   DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
BAG RESULTS                                   ABS. HUMIDITY 11.4 GM/KG
  BAG NUMBER                                                                           NOX HUMIDITY CORRECTION FACTOR  1.02
  DESCRIPTION                                       1                 2                 3                 4
                                             COLD TRANSIENT      STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)               914.4 (36.0)      914.4 (36.0)      914.4 (36.0)      914.4 (36.0)
  BLOWER INLET P MM. H2O(IN. H2O)             889.0 (35.0)      889.0 (35.0)      889.0 (35.0)      889.0 (35.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)            34.4 ( 94.0)      36.7 ( 98.0)      37.8 (100.0)      39.4 (103.0)
  BLOWER REVOLUTIONS                             4993.             8569.             4994.             8571.
  TOT FLOW STD. CU. METRES(SCF)               148.5 ( 5244.)    253.5 ( 8952.)    147.4 ( 5203.)    251.9 ( 8895.)
  THC  SAMPLE METER/RANGE/PPM                 13.3/11/  13.      9.6/11/  10.     10.3/11/  10.      9.0/11/   9.
  THC  BCKGRD METER/RANGE/PPM                  5.7/ 1/   6.      5.6/ 1/   6.      5.6/ 1/   6.      5.5/ 1/   6.
  CO   SAMPLE METER/RANGE/PPM                 28.6/13/  26.     17.0/13/  15.     23.0/13/  21.     16.6/13/  15.
  CO   BCKGRD METER/RANGE/PPM                  1.8/13/   2.      1.9/13/   2.      1.2/13/   1.      2.1/13/   2.
  CO2  SAMPLE METER/RANGE/PCT                 38.1/ 3/  .64     22.3/ 3/  .36     32.5/ 3/  .54     21.9/ 3/  .35
  CO2  BCKGRD METER/RANGE/PCT                  2.9/ 3/  .04      3.2/ 3/  .05      2.8/ 3/  .04      2.7/ 3/  .04
  NOX  SAMPLE METER/RANGE/PPM                 18.4/ 2/  18.     11.3/ 2/  11.     17.6/ 2/  18.     11.1/ 2/  11.
  NOX  BCKGRD METER/RANGE/PPM                   .6/ 2/   1.       .6/ 2/   1.       .4/ 2/   0.       .5/ 2/   1.
  DILUTION FACTOR                                20.73             36.88             24.65             37.60
  THC  CONCENTRATION PPM                          8.                4.                5.                4.
  CO   CONCENTRATION PPM                         24.               13.               19.               13.
  CO2  CONCENTRATION PCT                          .60               .31               .50               .31
  NOX  CONCENTRATION PPM                         17.8              10.7              17.2              10.6
  FILTER WT. MG (EFFICIENCY, %)               3.184 (99.)       2.352 (98.)       2.435 (99.)       2.107 (92.)
  THC  MASS GRAMS                                 .68               .61               .42               .53
  CO   MASS GRAMS                                4.14              3.96              3.32              3.78
  CO2  MASS GRAMS                              1632.2            1453.9            1347.3            1447.5
  NOX  MASS GRAMS                                5.18              5.32              4.96              5.23
  PARTICULATE MASS GRAMS                         2.13              1.63              1.60              1.56

  THC   GRAMS/KM                                  .12               .10               .07               .08
  CO    GRAMS/KM                                  .73               .64               .58               .61
  CO2   GRAMS/KM                                286.9             234.5             237.0             233.2
  NOX   GRAMS/KM                                  .91               .86               .87               .84
  FUEL CONSUMPTION BY CB L/100KM                10.73              8.77              8.86              8.72

  RUN TIME                   SECONDS             505.              867.              505.              867.
  MEASURED DISTANCE          KM                  5.69              6.20              5.68              6.21
  SCF, DRY                                       .976              .979              .977              .979
       DFC, WET (DRY)                                     .978                                .978
       TOT VOL (SCM) / SAM BLR (SCM)                  .965( .948)                         .968( .951)
       KM  (MEASURED)                               402.0/ 76.84                        399.3/ 76.89
       FUEL CONSUMPTION L/100KM                         11.89                               11.89
                                                         9.71                                8.79
COMPOSITE RESULTS
  TEST NUMBER           6150-1
  BAROMETER    MM HG    742.4                 CARBON DIOXIDE          G/KM         3-BAG        (4-BAG)
  HUMIDITY     G/KG      11.4                 FUEL CONSUMPTION        L/100KM      246.0       ( 245.6)
  TEMPERATURE  DEG C     25.0                 HYDROCARBONS (THC)      G/KM           9.20      (   9.18)
                                              CARBON MONOXIDE         G/KM            .10      (    .09)
                                              OXIDES OF NITROGEN      G/KM            .64      (    .63)
                                              PARTICULATES            G/KM            .87      (    .87)
                                                                                      .291     (   .288)
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                                          FTP   - VEHICLE EMISSIONS RESULTS -80000 KM W/O TRAP
                                                  PROJECT 05-5810-001

TEST NO.   6150-2   RUN   1                   VEHICLE NO.61
VEHICLE MODEL   80 MERCEDES 300D              DATE     7/12/82                      TEST WEIGHT  1814. KG( 4000. LBS)
ENGINE 3.0 L(183. CID) L-5                    BAG CART NO. 1 / CVS NO. 17           ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
TRANSMISSION A3                               DYNO NO.    12                        DIESEL    EM-465-F
                                                                                    ODOMETER 94617. KM(58792. MILES)
BAROMETER 744.47 MM HG(29.31 IN HG)           DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  66. PCT                    ABS. HUMIDITY 12.6 GM/KG
BAG RESULTS                                                                         NOX HUMIDITY CORRECTION FACTOR  1.07
   BAG NUMBER                                    1                  2                  3                  4
   DESCRIPTION                              COLD TRANSIENT      STABILIZED        HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)            914.4 (36.0)       914.4 (36.0)       914.4 (36.0)       914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)          889.0 (35.0)       889.0 (35.0)       889.0 (35.0)       889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)         36.1 ( 97.0)       37.8 (100.0)       37.8 (100.0)       37.8 (100.0)
   BLOWER REVOLUTIONS                          4988.              8566.              4987.              8567.
   TOT FLOW STD. CU. METRES(SCF)            148.1 ( 5228.)     253.2 ( 8942.)     147.6 ( 5213.)     253.6 ( 8955.)
   THC SAMPLE METER/RANGE/PPM               14.1/11/  14.       9.0/11/   9.      10.4/11/  10.       8.6/11/   9.
   THC BCKGRD METER/RANGE/PPM                5.6/ 1/   6.       5.6/ 1/   6.       5.6/ 1/   6.       5.3/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM               28.9/13/  27.      15.5/13/  14.      23.6/13/  22.      15.3/13/  14.
   CO  BCKGRD METER/RANGE/PPM                1.3/13/   1.       1.5/13/   1.       1.2/13/   1.       1.6/13/   1.
   CO2 SAMPLE METER/RANGE/PCT               39.8/ 3/  .67      22.4/ 3/  .36      34.3/ 3/  .57      21.4/ 3/  .35
   CO2 BCKGRD METER/RANGE/PCT                2.6/ 3/  .04       2.4/ 3/  .04       2.9/ 3/  .04       2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM               21.0/ 2/  21.      12.1/ 2/  12.      19.6/ 2/  20.      11.2/ 2/  11.
   NOX BCKGRD METER/RANGE/PPM                2.2/ 2/   2.       1.4/ 2/   1.       1.2/ 2/   1.        .9/ 2/   1.
   DILUTION FACTOR                             19.76              36.72              23.26              38.54
   THC CONCENTRATION PPM                        9.                 4.                 5.                 3.
   CO  CONCENTRATION PPM                       25.                12.                20.                12.
   CO2 CONCENTRATION PCT                        .64                .33                .53                .31
   NOX CONCENTRATION PPM                       18.9               10.7               18.5               10.3
   FILTER WT. MG (EFFICIENCY, %)            2.907 (98.)        2.282 (98.)        2.639 (98.)        2.222 (99.)
   THC MASS GRAMS                               .75                .52                .43                .50
   CO  MASS GRAMS                              4.23               3.65               3.41               3.58
   CO2 MASS GRAMS                            1724.8             1516.0             1433.9             1431.3
   NOX MASS GRAMS                              5.71               5.54               5.55               5.34
   PARTICULATE MASS GRAMS                      1.93               1.54               1.79               1.51

   THC  GRAMS/KM                                .13                .08                .07                .08
   CO   GRAMS/KM                                .73                .59                .59                .57
   CO2  GRAMS/KM                              297.9              244.4              246.6              229.3
   NOX  GRAMS/KM                                .99                .89                .95                .85
   FUEL CONSUMPTION BY CB L/100KM             11.14               9.13               9.22               8.57

   RUN TIME                  SECONDS           505.               867.               505.               867.
   MEASURED DISTANCE         KM                5.79               6.20               5.82               6.24
   SCF, DRY                                    .972               .975               .973               .975
      DFC, WET (DRY)                                   .974                                 .975
      TOT VOL (SCM) / SAM BLR (SCM)                .964( .944)                          .968( .947)
      KM  (MEASURED)                              401.3/ 76.96                         401.2/ 77.09
      FUEL CONSUMPTION L/100KM                       11.99                                12.06
                                                     10.10                                 8.88
COMPOSITE RESULTS
   TEST NUMBER              6150-2
   BAROMETER      MM HG      744.5                  CARBON DIOXIDE          G/KM        3-BAG      (4-BAG)
   HUMIDITY       G/KG        12.6                  FUEL CONSUMPTION        L/100KM     256.1      ( 251.7)
   TEMPERATURE    DEG C       23.9                  HYDROCARBONS (THC)      G/KM         9.57      (  9.41)
                                                    CARBON MONOXIDE         G/KM          .09      (   .09)
                                                    OXIDES OF NITROGEN      G/KM          .62      (   .61)
                                                    PARTICULATES            G/KM          .93      (   .92)
                                                                                          .282     (  .280)
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                                  FTP   - VEHICLE EMISSIONS RESULTS -80000 KM W/ TRAP
                                           PROJECT 05-5810-001

TEST NO.   6150T1   RUN   1                   VEHICLE NO.61                              TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D              DATE    7/ 7/82                            ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                    BAG CART NO. 1 / CVS NO. 17                DIESEL    EM-465-F
TRANSMISSION A3                               DYNO NO.      2                            ODOMETER 94375. KM(58642. MILES)

BAROMETER 742.70 MM HG(29.24 IN HG)           DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  53. PCT                    ABS. HUMIDITY 10.7 GM/KG                   NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                                      1                  2                    3                    4
  DESCRIPTION                               COLD TRANSIENT       STABILIZED          HOT TRANSIENT          STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)             914.4 (36.0)        914.4 (36.0)        914.4 (36.0)         660.4 (26.0)
  BLOWER INLET P MM. H2O(IN. H2O)           889.0 (35.0)        889.0 (35.0)        889.0 (35.0)         889.0 (35.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)          35.6 ( 96.0)        36.7 ( 98.0)        37.2 ( 99.0)         37.8 (100.0)
  BLOWER REVOLUTIONS                          4989.               8582.               4987.                8580.
  TOT FLOW STD. CU. METRES(SCF)             148.1 ( 5230.)      254.1 ( 8973.)      147.5 ( 5207.)       257.6 ( 9096.)
  THC SAMPLE METER/RANGE/PPM                12.5/11/  12.        7.2/11/   7.        9.0/11/   9.         7.5/11/   8.
  THC BCKGRD METER/RANGE/PPM                 5.3/ 1/   5.        5.3/ 1/   5.        5.3/ 1/   5.         5.4/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                27.1/13/  25.       14.8/13/  13.       21.8/13/  20.        14.9/13/  14.
  CO  BCKGRD METER/RANGE/PPM                  .9/13/   1.        1.0/13/   1.        1.0/13/   1.          .9/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                39.2/ 3/  .66       22.4/ 3/  .36       34.2/ 3/  .57        21.5/ 3/  .35
  CO2 BCKGRD METER/RANGE/PCT                 3.0/ 3/  .05        3.0/ 3/  .05        2.7/ 3/  .04         2.5/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                19.8/ 2/  20.       11.4/ 2/  11.       19.7/ 2/  20.        11.5/ 2/  12.
  NOX BCKGRD METER/RANGE/PPM                  .7/ 2/   1.         .6/ 2/   1.         .7/ 2/   1.          .7/ 2/   1.
  DILUTION FACTOR                             20.10               36.75               23.34                38.37
  THC CONCENTRATION PPM                         7.                  2.                  4.                   2.
  CO  CONCENTRATION PPM                        23.                 12.                 18.                  12.
  CO2 CONCENTRATION PCT                        .62                 .32                 .53                  .31
  NOX CONCENTRATION PPM                       19.1                10.8                19.0                 10.8
  FILTER WT. MG (EFFICIENCY, %)             .170 (80.)          .101 (83.)          .138 (73.)           .112 (85.)
  THC MASS GRAMS                               .64                 .31                 .34                  .34
  CO  MASS GRAMS                              4.02                3.62                3.17                 3.72
  CO2 MASS GRAMS                            1679.4              1479.3              1435.4               1462.0
  NOX MASS GRAMS                              5.41                5.25                5.36                 5.32
  PARTICULATE MASS GRAMS                       .14                 .08                 .13                  .09

  THC   GRAMS/KM                               .11                 .05                 .06                  .05
  CO    GRAMS/KM                               .69                 .58                 .55                  .59
  CO2   GRAMS/KM                             287.9               235.7               248.1                232.5
  NOX   GRAMS/KM                               .93                 .84                 .93                  .85
  FUEL CONSUMPTION BY CB L/100KM             10.76                8.81                9.27                 8.69

  RUN TIME              SECONDS               505.                868.                505.                 868.
  MEASURED DISTANCE     KM                    5.83                6.28                5.79                 6.29
  SCF, DRY                                    .977       .979     .980                .978        .979     .980
       DFC, WET (DRY)                               .964( .948)                             .968( .951)
       TOT VOL (SCM) / SAM BLR (SCM)              402.2/ 76.98                            405.1/ 76.92
       KM  (MEASURED)                                 12.11                                   12.07
       FUEL CONSUMPTION L/100KM                        9.75                                    8.97

COMPOSITE RESULTS
  TEST NUMBER              6150T1                                                         3-BAG       (4-BAG)
  BAROMETER      MM HG    742.7                   CARBON DIOXIDE          G/KM            249.9       ( 248.9)
  HUMIDITY       G/KG      10.7                   FUEL CONSUMPTION        L/100KM          9.34       (  9.30)
  TEMPERATURE    DEG C     25.0                   HYDROCARBONS (THC)      G/KM              .06       (   .07)
                                                  CARBON MONOXIDE         G/KM              .59       (   .60)
                                                  OXIDES OF NITROGEN      G/KM              .88       (   .88)
                                                  PARTICULATES            G/KM             .018       (  .018)
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                                FTP   - VEHICLE EMISSIONS RESULTS -80000 KM W/ TRAP
                                        PROJECT 05-5810-001

TEST NO.   6150T2   RUN   1                    VEHICLE NO.61                              TEST WEIGHT  1814. KG( 4000. LBS)
VEHICLE MODEL   80 MERCEDES 300D                DATE    7/ 8/82                            ACTUAL ROAD LOAD   9.7 KW( 13.0 HP)
ENGINE 3.0 L(183. CID) L-5                      BAG CART NO. 1 / CVS NO. 17                DIESEL    EM-465-F
TRANSMISSION A3                                 DYNO NO.      2                            ODOMETER 94399. KM(58657. MILES)

BAROMETER 743.97 MM HG(29.29 IN HG)             DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY  64. PCT                      ABS. HUMIDITY 13.4 GM/KG                   NOX HUMIDITY CORRECTION FACTOR  1.10
BAG RESULTS
   BAG NUMBER                                      1                    2                      3                     4
   DESCRIPTION                                COLD TRANSIENT        STABILIZED           HOT TRANSIENT          STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)              914.4 (36.0)         914.4 (36.0)         914.4 (36.0)          914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)            889.0 (35.0)         889.0 (35.0)         889.0 (35.0)          889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)           40.6 (105.0)         41.1 (106.0)         39.4 (103.0)          39.4 (103.0)
   BLOWER REVOLUTIONS                            4994.                8580.                4989.                 8572.
   TOT FLOW STD. CU. METRES(SCF)              146.8 ( 5183.)       251.8 ( 8892.)       147.0 ( 5191.)        252.6 ( 8920.)
   THC SAMPLE METER/RANGE/PPM                 11.0/11/  11.         6.7/11/   7.         8.4/11/   8.          6.8/11/   7.
   THC BCKGRD METER/RANGE/PPM                  4.5/ 1/   5.         4.3/ 1/   4.         4.3/ 1/   4.          4.5/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM                 26.3/13/  24.        13.5/13/  12.        19.2/13/  17.         13.1/13/  12.
   CO  BCKGRD METER/RANGE/PPM                   .7/13/   1.          .6/13/   1.          .1/13/   0.           .4/13/   0.
   CO2 SAMPLE METER/RANGE/PCT                 40.1/ 3/  .68        23.7/ 3/  .39        34.7/ 3/  .58         23.2/ 3/  .38
   CO2 BCKGRD METER/RANGE/PCT                  3.1/ 3/  .05         3.4/ 3/  .05         3.9/ 3/  .06          3.7/ 3/  .06
   NOX SAMPLE METER/RANGE/PPM                 18.8/ 2/  19.        11.2/ 2/  11.        18.5/ 2/  19.         11.3/ 2/  11.
   NOX BCKGRD METER/RANGE/PPM                   .7/ 2/   1.          .7/ 2/   1.          .7/ 2/   1.           .7/ 2/   1.
   DILUTION FACTOR                              19.62                34.64                22.99                 35.43
   THC CONCENTRATION PPM                         7.                   2.                   4.                    2.
   CO  CONCENTRATION PPM                        23.                  11.                  17.                   11.
   CO2 CONCENTRATION PCT                         .63                  .33                  .52                   .32
   NOX CONCENTRATION PPM                        18.1                 10.5                 17.8                  10.6
   FILTER WT. MG (EFFICIENCY, %)              .254 (84.)           .121 (81.)           .175 (82.)            .129 (79.)
   THC MASS GRAMS                                .57                  .36                  .36                   .36
   CO  MASS GRAMS                               3.88                 3.33                 2.88                  3.29
   CO2 MASS GRAMS                             1705.2               1542.1               1407.9                1485.9
   NOX MASS GRAMS                               5.59                 5.56                 5.50                  5.63
   PARTICULATE MASS GRAMS                        .20                  .10                  .14                   .11

   THC   GRAMS/KM                                .10                  .06                  .06                   .06
   CO    GRAMS/KM                                .68                  .54                  .51                   .53
   CO2   GRAMS/KM                              300.7                250.9                247.0                 239.6
   NOX   GRAMS/KM                                .98                  .90                  .97                   .91
   FUEL CONSUMPTION BY CB L/100KM              11.24                 9.37                 9.23                  8.95

   RUN TIME              SECONDS                505.                 868.                 505.                  867.
   MEASURED DISTANCE     KM                     5.67                 6.15                 5.70                  6.20
   SCF, DRY                                     .973       .975      .976                 .974        .975      .976
        DFC, WET (DRY)                                .963( .943)                                .966( .946)
        TOT VOL (SCM) / SAM BLR (SCM)                398.6/ 77.12                               399.6/ 77.07
        KM  (MEASURED)                                  11.82                                      11.90
        FUEL CONSUMPTION L/100KM                        10.27                                      9.08

COMPOSITE RESULTS
   TEST NUMBER             6150T2                                                                  3-BAG      (4-BAG)
   BAROMETER      MM HG    744.0                          CARBON DIOXIDE          G/KM            260.1     ( 256.7)
   HUMIDITY       G/KG      13.4                          FUEL CONSUMPTION        L/100KM           9.72    (   9.59)
   TEMPERATURE    DEG C     25.6                          HYDROCARBONS (THC)      G/KM               .07    (    .07)
                                                          CARBON MONOXIDE         G/KM               .56    (    .56)
                                                          OXIDES OF NITROGEN      G/KM               .94    (    .94)
                                                          PARTICULATES            G/KM              .022    (   .023)
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APPENDIX H

DURABILITY EVALUATION OF NGK TRAP ON THE DATSUN

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                                           FTP   - VEHICLE EMISSIONS RESULTS -0 KM W/O TRAP
                                                   PROJECT 05-5810-001

TEST NO.   6500-1   RUN                       VEHICLE NO.65                          TEST WEIGHT  1531. KG( 3375. LBS)
VEHICLE MODEL   82 DATSUN MAXIMA              DATE    5/ 4/82                        ACTUAL ROAD LOAD   7.2 KW(  9.7 HP)
ENGINE 2.8 L(170. CID) 6                      BAG CART NO. 1 / CVS NO.  3            DIESEL     EM-487-F
TRANSMISSION A3                               DYNO NO.      2                        ODOMETER  2290. KM( 1423. MILES)

BAROMETER 743.20 MM HG(29.26 IN HG)           DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
RELATIVE HUMIDITY  47. PCT                    ABS. HUMIDITY 10.2 GM/KG               NOX HUMIDITY CORRECTION FACTOR    .98
BAG RESULTS
  BAG NUMBER                                      1               2                 3               4
  DESCRIPTION                               COLD TRANSIENT    STABILIZED       HOT TRANSIENT     STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)              690.9 (27.2)     698.5 (27.5)     693.4 (27.3)     693.4 (27.3)
  BLOWER INLET P MM. H2O(IN. H2O)            561.3 (22.1)     561.3 (22.1)     561.3 (22.1)     566.4 (22.3)
  BLOWER INLET TEMP. DEG. C(DEG. F)           35.6 ( 96.0)     33.9 ( 93.0)     35.6 ( 96.0)     33.3 ( 92.0)
  BLOWER REVOLUTIONS                           13889.           23809.           13886.           23814.
  TOT FLOW STD. CU. METRES(SCF)              135.9 ( 4799.)   233.6 ( 8250.)   135.9 ( 4798.)   233.9 ( 8258.)
  HC   SAMPLE METER/RANGE/PPM                34.4/11/  34.    12.9/11/  13.    17.7/11/  18.    12.8/11/  13.
  HC   BCKGRD METER/RANGE/PPM                 6.0/ 1/   6.     6.2/ 1/   6.     6.2/ 1/   6.     5.9/ 1/   6.
  CO   SAMPLE METER/RANGE/PPM                38.3/13/  36.    20.6/13/  19.    30.6/13/  28.    20.0/13/  18.
  CO   BCKGRD METER/RANGE/PPM                 1.9/13/   2.     1.8/13/   2.     1.7/13/   2.     1.7/13/   2.
  CO2  SAMPLE METER/RANGE/PCT                38.0/ 3/  .64    23.6/ 3/  .38    33.8/ 3/  .56    22.7/ 3/  .37
  CO2  BCKGRD METER/RANGE/PCT                 2.9/ 3/  .04     3.0/ 3/  .05     3.1/ 3/  .05     3.1/ 3/  .05
  NOX  SAMPLE METER/RANGE/PPM                15.2/ 2/  15.    10.0/ 2/  10.    14.4/ 2/  14.    11.1/ 2/  11.
  NOX  BCKGRD METER/RANGE/PPM                  .8/ 2/   1.     1.0/ 2/   1.     1.1/ 2/   1.     1.7/ 2/   2.
  DILUTION FACTOR                               20.69            34.68            23.57            36.13
  HC   CONCENTRATION PPM                        29.              7.               12.              7.
  CO   CONCENTRATION PPM                        33.              17.              26.              16.
  CO2  CONCENTRATION PCT                        .60              .34              .52              .32
  NOX  CONCENTRATION PPM                        14.4             9.0              13.3             9.4
  FILTER WT. MG (EFFICIENCY, %)              1.920 (95.)      1.460 (94.)      1.492 (95.)      1.309 (94.)
  HC   MASS GRAMS                               2.25             .92              .92              .95
  CO   MASS GRAMS                               5.22             4.57             4.11             4.45
  CO2  MASS GRAMS                             1489.3           1449.0           1289.8           1377.3
  NOX  MASS GRAMS                               3.69             3.96             3.41             4.15
  PARTICULATE MASS GRAMS                        1.20             .99              .98              .88

  HC   GRAMS/KM                                 .39              .15              .16              .15
  CO   GRAMS/KM                                 .90              .73              .71              .71
  CO2  GRAMS/KM                               256.9            231.9            222.6            220.5
  NOX  GRAMS/KM                                 .64              .63              .59              .66
  FUEL CONSUMPTION BY CB L/100KM                9.65             8.69             8.34             8.26

  RUN TIME              SECONDS                 506.             867.             506.             867.
  MEASURED DISTANCE     KM                      5.80             6.25             5.79             6.25
  SCF, DRY                                      .979     .980    .981             .980     .981    .981
      DFC, WET (DRY)                                 .964( .949)                       .967( .952)
      TOT VOL (SCM) / SAM BLR (SCM)                369.6/ 78.11                      369.8/ 78.11
      KM  (MEASURED)                                  12.05                             12.04
      FUEL CONSUMPTION L/100KM                         9.15                              8.30

COMPOSITE RESULTS
  TEST NUMBER           6500-1                                                        3-BAG      (4-BAG)
  BAROMETER    MM HG     743.2            CARBON DIOXIDE          G/KM               234.5      ( 231.2)
  HUMIDITY     G/KG       10.2            FUEL CONSUMPTION        L/100KM             8.79      (  8.67)
  TEMPERATURE  DEG C      26.1            HYDROCARBONS (THC)      G/KM                 .20      (   .20)
                                          CARBON MONOXIDE         G/KM                 .76      (   .75)
                                          OXIDES OF NITROGEN      G/KM                 .62      (   .63)
                                          PARTICULATES            G/KM                .171      (  .166)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -0 KM W/O TRAP
                                                PROJECT 05-5810-001
TEST NO.   6500-2   RUN
VEHICLE MODEL   82 DATSUN MAXIAM                VEHICLE NO.65                       TEST WEIGHT  1531. KG( 3375. LBS)
ENGINE 2.8 L(170. CID) 6                        DATE    5/ 5/82                     ACTUAL ROAD LOAD   7.2 KW(  9.7 HP)
TRANSMISSION A3                                 BAG CART NO. 1 / CVS NO.  3         DIESEL    EM-487-F
                                                DYNO NO.      2                     ODOMETER  2316. KM( 1439. MILES)

BAROMETER 741.17 MM HG(29.18 IN HG)             DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
RELATIVE HUMIDITY  53. PCT                      ABS. HUMIDITY 10.7 GM/KG            NOX HUMIDITY CORRECTION FACTOR  1.00
BAG RESULTS
  BAG NUMBER                                         1                 2                  3                 4
  DESCRIPTION                                  COLD TRANSIENT      STABILIZED       HOT TRANSIENT       STABILIZED

  BLOWER DIF P MM. H2O(IN. H2O)                685.8 (27.0)      685.8 (27.0)      685.8 (27.0)      685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)              558.8 (22.0)      558.8 (22.0)      558.8 (22.0)      558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)             37.8 (100.0)      32.2 ( 90.0)      35.6 ( 96.0)      32.2 ( 90.0)
  BLOWER REVOLUTIONS                              13867.            23814.            13877.            23680.
  TOT FLOW STD. CU. METRES(SCF)                135.0 ( 4767.)    233.7 ( 8253.)    135.5 ( 4785.)    232.8 ( 8219.)
  HC  SAMPLE METER/RANGE/PPM                   30.1/11/  30.     11.9/11/  12.     16.0/11/  16.     11.8/11/  12.
  HC  BCKGRD METER/RANGE/PPM                    4.4/ 1/   4.      4.9/ 1/   5.      4.9/ 1/   5.      4.8/ 1/   5.
  CO  SAMPLE METER/RANGE/PPM                   36.3/13/  34.     19.9/13/  18.     28.2/13/  26.     19.1/13/  17.
  CO  BCKGRD METER/RANGE/PPM                     .8/13/   1.       .9/13/   1.       .7/13/   1.       .9/13/   1.
  CO2 SAMPLE METER/RANGE/PCT                   37.4/ 3/  .63     23.0/ 3/  .37     33.8/ 3/  .56     22.0/ 3/  .36
  CO2 BCKGRD METER/RANGE/PCT                    2.6/ 3/  .04      2.7/ 3/  .04      2.9/ 3/  .04      2.9/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM                   15.1/ 2/  15.      9.5/ 2/  10.     14.0/ 2/  14.      9.6/ 2/  10.
  NOX BCKGRD METER/RANGE/PPM                     .6/ 2/   1.       .6/ 2/   1.       .6/ 2/   1.       .6/ 2/   1.
  DILUTION FACTOR                                 21.07             35.65             23.59             37.36
  HC  CONCENTRATION PPM                            26.                7.               11.                7.
  CO  CONCENTRATION PPM                            32.               17.               25.               16.
  CO2 CONCENTRATION PCT                            .59               .33               .52               .31
  NOX CONCENTRATION PPM                           14.5               8.9              13.4               9.0
  FILTER WT. MG (EFFICIENCY, %)                2.052 (96.)       1.353 (96.)       1.417 (96.)       1.200 (95.)
  HC  MASS GRAMS                                  2.01               .96               .88               .95
  CO  MASS GRAMS                                  5.02              4.60              3.87              4.38
  CO2 MASS GRAMS                                1462.8            1424.2            1293.7            1332.1
  NOX MASS GRAMS                                  3.75              3.98              3.48              4.01
  PARTICULATE MASS GRAMS                          1.28               .86               .89               .77

  HC  GRAMS/KM                                     .35               .15               .15               .15
  CO  GRAMS/KM                                     .87               .73               .67               .71
  CO2 GRAMS/KM                                   251.9             226.5             222.4             214.5
  NOX GRAMS/KM                                     .65               .63               .60               .65
  FUEL CONSUMPTION BY CB L/100KM                  9.46              8.49              8.33              8.04

  RUN TIME           SECONDS                      505.              861.              505.              862.
  MEASURED DISTANCE    KM                         5.81              6.29              5.82              6.21
  SCF, DRY                                        .977      .979      .980              .978      .979      .980
      DFC, WET (DRY)                                   .965( .948)                          .967( .951)
      TOT VOL (SCM) / SAM BLR (SCM)                   368.7/ 78.01                         368.3/ 77.76
      KM  (MEASURED)                                     12.10                                12.03
      FUEL CONSUMPTION L/100KM                            8.95                                 8.18
COMPOSITE RESULTS
  TEST NUMBER           6500-2                                                     3-BAG       (4-BAG)
  BAROMETER     MM HG    741.2                  CARBON DIOXIDE        G/KM         230.6      ( 227.1)
  HUMIDITY      G/KG      10.7                  FUEL CONSUMPTION      L/100KM       8.64      (   8.51)
  TEMPERATURE   DEG C     25.0                  HYDROCARBONS (THC)    G/KM           .19      (    .19)
                                                CARBON MONOXIDE       G/KM           .74      (    .73)
                                                OXIDES OF NITROGEN    G/KM           .63      (    .63)
                                                PARTICULATES          G/KM          .158      (   .154)
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                                            FTP   - VEHICLE EMISSIONS RESULTS -0 KM WITH TRAP
                                                    PROJECT 05-5810-001
TEST NO.    6500T1   RUN
VEHICLE MODEL   82 DATSUN MAXIMA            VEHICLE NO.65                          TEST WEIGHT  1531. KG( 3375. LBS)
ENGINE 2.8 L(170. CID) 6                    DATE    5/ 6/82                        ACTUAL ROAD LOAD   7.2 KW(  9.7 HP)
TRANSMISSION A3                             BAG CART NO. 1 / CVS NO.  3            DIESEL    EM-487-F
                                            DYNO NO.      2                        ODOMETER  2371. KM( 1473. MILES)
BAROMETER 739.14 MM HG(29.10 IN HG)
RELATIVE HUMIDITY  49. PCT                  DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
BAG RESULTS                                 ABS. HUMIDITY 10.0 GM/KG
  BAG NUMBER                                                                       NOX HUMIDITY CORRECTION FACTOR   .98
  DESCRIPTION                                      1                2                   3                   4
                                            COLD TRANSIENT      STABILIZED          HOT TRANSIENT        STABILIZED
  BLOWER DIF P MM. H2O(IN. H2O)            685.8 (27.0)       685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
  BLOWER INLET P MM. H2O(IN. H2O)          558.8 (22.0)       558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
  BLOWER INLET TEMP. DEG. C(DEG. F)         35.6 ( 96.0)       32.2 ( 90.0)        36.1 ( 97.0)        35.0 ( 95.0)
  BLOWER REVOLUTIONS                          13866.             23832.              13877.              23810.
  TOT FLOW STD. CU. METRES(SCF)            135.0 ( 4767.)     233.5 ( 8246.)      135.0 ( 4766.)      231.8 ( 8185.)
  HC  SAMPLE METER/RANGE/PPM               31.1/11/  31.      11.4/11/  11.       16.3/11/  16.       11.4/11/  11.
  HC  BCKGRD METER/RANGE/PPM                6.0/ 1/   6.       5.8/ 1/   6.        5.8/ 1/   6.        5.7/ 1/   6.
  CO  SAMPLE METER/RANGE/PPM               39.9/13/  37.      21.2/13/  19.       30.2/13/  28.       19.9/13/  18.
  CO  BCKGRD METER/RANGE/PPM                2.1/13/   2.       1.9/13/   2.        1.8/13/   2.        1.7/13/   2.
  CO2 SAMPLE METER/RANGE/PCT               38.8/ 3/  .66      24.0/ 3/  .39       33.3/ 3/  .55       22.8/ 3/  .37
  CO2 BCKGRD METER/RANGE/PCT                2.9/ 3/  .04       2.9/ 3/  .04        2.8/ 3/  .04        2.7/ 3/  .04
  NOX SAMPLE METER/RANGE/PPM               15.3/ 2/  15.      10.0/ 2/  10.       14.6/ 2/  15.       10.8/ 2/  11.
  NOX BCKGRD METER/RANGE/PPM                 .8/ 2/   1.       1.1/ 2/   1.        1.4/ 2/   1.        1.6/ 2/   2.
  DILUTION FACTOR                             20.24              34.07               23.96               35.98
  HC  CONCENTRATION PPM                       25.                 6.                 11.                  6.
  CO  CONCENTRATION PPM                       34.                17.                 26.                 16.
  CO2 CONCENTRATION PCT                       .61                .35                 .51                 .33
  NOX CONCENTRATION PPM                       14.5               8.9                13.3                 9.2
  FILTER WT. MG (EFFICIENCY, %)             .366 (81.)        .164 (73.)          .298 (81.)          .160 (71.)
  HC  MASS GRAMS                              1.98               .78                 .84                 .78
  CO  MASS GRAMS                              5.39              4.68                4.01                4.38
  CO2 MASS GRAMS                            1515.8            1484.4              1269.8              1397.8
  NOX MASS GRAMS                              3.67              3.90                3.35                4.01
  PARTICULATE MASS GRAMS                      .29                .14                 .23                 .14

  HC  GRAMS/KM                                .34                .13                 .14                 .13
  CO  GRAMS/KM                                .94                .75                 .69                 .70
  CO2 GRAMS/KM                               263.2              238.2               219.5               224.3
  NOX GRAMS/KM                                .64                .63                 .58                 .64
  FUEL CONSUMPTION BY CB L/100KM              9.88               8.92                8.22                8.40

  RUN TIME             SECONDS                505.               868.                505.                863.
  MEASURED DISTANCE    KM                     5.76               6.23                5.78                6.23
  SCF, DRY                                    .978               .981                .979                .981
       DFC, WET (DRY)                                 .980                                     .980
       TOT VOL (SCM) / SAM BLR (SCM)               .963( .948)                             .967( .952)
       KM  (MEASURED)                             368.5/ 77.77                            366.8/ 77.70
       FUEL CONSUMPTION L/100KM                       11.99                                    12.02
                                                       9.38                                     8.31
COMPOSITE RESULTS
  TEST NUMBER            6500T1                                                          3-BAG        (4-BAG)
  BAROMETER     MM HG     739.1                     CARBON DIOXIDE           G/KM        238.2       ( 234.1)
  HUMIDITY      G/KG       10.0                     FUEL CONSUMPTION         L/100KM       8.93      (   8.77)
  TEMPERATURE   DEG C      25.0                     HYDROCARBONS (THC)       G/KM          .18       (   .18)
                                                    CARBON MONOXIDE          G/KM          .77       (   .76)
                                                    OXIDES OF NITROGEN       G/KM          .62       (   .62)
                                                    PARTICULATES             G/KM         .033       (  .033)
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                                   FTP   - VEHICLE EMISSIONS RESULTS -0 KM WITH TRAP
                                            PROJECT 05-5810-001

TEST NO.   6500T2   RUN                       VEHICLE NO.65
VEHICLE MODEL   82 DATSUN MAXIAM              DATE    5/ 7/82                            TEST WEIGHT  1531. KG( 3375. LBS)
ENGINE 2.8 L(170. CID) 6                      BAG CART NO. 1 / CVS NO.  3               ACTUAL ROAD LOAD   7.1 KW(  9.5 HP)
TRANSMISSION A3                               DYNO NO.       2                           DIESEL    EM-487-F
                                                                                          ODOMETER  2396. KM( 1489. MILES)
BAROMETER 744.47 MM HG(29.31 IN HG)           DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)
RELATIVE HUMIDITY  53. PCT                    ABS. HUMIDITY  8.7 GM/KG                   NOX HUMIDITY CORRECTION FACTOR   .94
BAG RESULTS
   BAG NUMBER                                     1                   2                   3                   4
   DESCRIPTION                              COLD TRANSIENT        STABILIZED         HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)             685.8 (27.0)        685.8 (27.0)        685.8 (27.0)        685.8 (27.0)
   BLOWER INLET P MM. H2O(IN. H2O)           558.8 (22.0)        558.8 (22.0)        558.8 (22.0)        558.8 (22.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)          33.3 ( 92.0)        30.6 ( 87.0)        33.9 ( 93.0)        31.1 ( 88.0)
   BLOWER REVOLUTIONS                         13834.              23790.              13866.              23798.
   TOT FLOW STD. CU. METRES(SCF)             136.2 ( 4811.)      235.9 ( 8330.)      136.4 ( 4817.)      235.6 ( 8320.)
   HC  SAMPLE METER/RANGE/PPM                31.5/11/  32.       10.4/11/  10.       14.4/11/  14.       10.0/11/  10.
   HC  BCKGRD METER/RANGE/PPM                 5.3/ 1/   5.        4.7/ 1/   5.        4.7/ 1/   5.        4.9/ 1/   5.
   CO  SAMPLE METER/RANGE/PPM                38.0/13/  35.       19.1/13/  17.       27.6/13/  25.       18.3/13/  17.
   CO  BCKGRD METER/RANGE/PPM                 2.0/13/   2.        1.8/13/   2.        1.4/13/   1.        1.5/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                38.5/ 3/  .65       23.9/ 3/  .39       33.1/ 3/  .55       22.6/ 3/  .37
   CO2 BCKGRD METER/RANGE/PCT                 2.5/ 3/  .04        2.7/ 3/  .04        2.2/ 3/  .03        2.5/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                18.0/ 2/  18.       10.3/ 2/  10.       14.8/ 2/  15.       10.5/ 2/  11.
   NOX BCKGRD METER/RANGE/PPM                 2.6/ 2/   3.        1.0/ 2/   1.        1.3/ 2/   1.         .9/ 2/   1.
   DILUTION FACTOR                               20.41               34.25               24.14               36.35
   HC  CONCENTRATION PPM                         26.                  6.                 10.                  5.
   CO  CONCENTRATION PPM                         33.                 15.                 23.                 15.
   CO2 CONCENTRATION PCT                          .61                 .35                 .52                 .33
   NOX CONCENTRATION PPM                         15.5                 9.3                13.6                 9.6
   FILTER WT. MG (EFFICIENCY, %)              .376 (82.)          .261 (76.)          .349 (85.)          .181 (77.)
   HC  MASS GRAMS                                2.08                 .80                 .78                 .71
   CO  MASS GRAMS                                5.16                4.23                3.72                4.10
   CO2 MASS GRAMS                             1530.6              1504.8              1296.4              1418.9
   NOX MASS GRAMS                                3.79                3.94                3.31                4.06
   PARTICULATE MASS GRAMS                         .29                 .22                 .26                 .15

   HC  GRAMS/KM                                   .36                 .13                 .13                 .11
   CO  GRAMS/KM                                   .89                 .67                 .64                 .65
   CO2 GRAMS/KM                                 264.2               239.3               222.5               225.4
   NOX GRAMS/KM                                   .65                 .63                 .57                 .65
   FUEL CONSUMPTION BY CB L/100KM                9.92                8.96                8.33                8.44

   RUN TIME              SECONDS                504.                867.                505.                867.
   MEASURED DISTANCE     KM                     5.79                6.29                5.83                6.30
   SCF, DRY                                     .977       .979     .979                .978       .979     .980
         DFC, WET (DRY)                               .964( .947)                             .967( .951)
         TOT VOL (SCM) / SAM BLR (SCM)               372.1/ 78.24                            372.0/ 78.26
         KM  (MEASURED)                                 12.08                                   12.12
         FUEL CONSUMPTION L/100KM                        9.42                                    8.38

COMPOSITE RESULTS                                                                                 3-BAG       (4-BAG)
   TEST NUMBER              6500T2                               CARBON DIOXIDE        G/KM      239.8      ( 235.7)
   BAROMETER       MM HG    744.5                                FUEL CONSUMPTION      L/100KM     8.98     (   8.83)
   HUMIDITY        G/KG       8.7                                HYDROCARBONS (THC)    G/KM         .18     (    .17)
   TEMPERATURE     DEG C     21.7                                CARBON MONOXIDE       G/KM         .71     (    .70)
                                                                 OXIDES OF NITROGEN    G/KM         .62     (    .62)
                                                                 PARTICULATES          G/KM        .040     (   .037)
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                                        FTP   - VEHICLE EMISSIONS RESULTS -8000 KM W/O TRAP
                                                PROJECT 05-5810-001

TEST NO.   6505-1   RUN   1                 VEHICLE NO.65                      TEST WEIGHT  1531. KG( 3375. LBS)
VEHICLE MODEL   82 DATSUN MAXIMA            DATE    6/15/82                    ACTUAL ROAD LOAD   7.2 KW(  9.7 HP)
ENGINE 2.8 L(170. CID) 6                    BAG CART NO. 1 / CVS NO. 17        DIESEL     EM-487-F
TRANSMISSION A3                             DYNO NO.      2                    ODOMETER 10725. KM( 6664. MILES)

BAROMETER 736.85 MM HG(29.01 IN HG)         DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  62. PCT                  ABS. HUMIDITY 12.0 GM/KG           NOX HUMIDITY CORRECTION FACTOR  1.04
BAG RESULTS
   BAG NUMBER                                   1                  2                 3                  4
   DESCRIPTION                            COLD TRANSIENT       STABILIZED      HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)           939.8 (37.0)       939.8 (37.0)      939.8 (37.0)       939.8 (37.0)
   BLOWER INLET P MM. H2O(IN. H2O)         914.4 (36.0)       914.4 (36.0)      914.4 (36.0)       914.4 (36.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)        41.1 (106.0)       39.4 (103.0)      39.4 (103.0)       39.4 (103.0)
   BLOWER REVOLUTIONS                          4991.              8571.             4990.              8565.
   TOT FLOW STD. CU. METRES(SCF)           144.7 ( 5110.)     249.5 ( 8811.)    145.3 ( 5129.)     249.3 ( 8803.)
   HC  SAMPLE METER/RANGE/PPM              33.1/11/  33.      13.1/11/  13.     19.1/11/  19.      14.4/11/  14.
   HC  BCKGRD METER/RANGE/PPM               6.5/ 1/   7.       5.7/ 1/   6.      5.7/ 1/   6.       5.7/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM              35.7/13/  33.      18.1/13/  16.     28.0/13/  26.      18.5/13/  17.
   CO  BCKGRD METER/RANGE/PPM                .8/13/   1.        .2/13/   0.       .4/13/   0.        .1/13/   0.
   CO2 SAMPLE METER/RANGE/PCT              34.5/ 3/  .58      21.3/ 3/  .34     30.3/ 3/  .50      20.7/ 3/  .33
   CO2 BCKGRD METER/RANGE/PCT               2.8/ 3/  .04       3.0/ 3/  .05      2.9/ 3/  .04       2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM              13.5/ 2/  14.       8.7/ 2/   9.     12.2/ 2/  12.       8.6/ 2/   9.
   NOX BCKGRD METER/RANGE/PPM                .9/ 2/   1.        .8/ 2/   1.       .8/ 2/   1.        .7/ 2/   1.
   DILUTION FACTOR                            22.98              38.65             26.51              39.81
   HC  CONCENTRATION PPM                      27.                 8.               14.                 9.
   CO  CONCENTRATION PPM                      31.                16.               25.                16.
   CO2 CONCENTRATION PCT                       .54                .30               .46                .29
   NOX CONCENTRATION PPM                      12.6                7.9              11.4                7.9
   FILTER WT. MG (EFFICIENCY, $)           1.560 (95.)        1.100 (95.)       1.301 (95.)         .962 (93.)
   HC  MASS GRAMS                              2.24               1.08              1.14               1.28
   CO  MASS GRAMS                              5.28               4.60              4.16               4.73
   CO2 MASS GRAMS                            1419.4             1366.3            1218.8             1325.0
   NOX MASS GRAMS                              3.65               3.95              3.31               3.94
   PARTICULATE MASS GRAMS                      1.07                .71               .90                .68

   HC  GRAMS/KM                                 .39                .17               .20                .20
   CO  GRAMS/KM                                 .91                .74               .71                .75
   CO2 GRAMS/KM                               244.3              218.4             209.5              210.8
   NOX GRAMS/KM                                 .63                .63               .57                .63
   FUEL CONSUMPTION BY CB L/100KM              9.19               8.19              7.86               7.91

   RUN TIME               SECONDS             505.               867.              505.               866.
   MEASURED DISTANCE      KM                  5.81               6.26              5.82               6.29
   SCF, DRY                                   .974      .976     .977              .975      .976     .977
        DFC, WET (DRY)                              .968( .948)                          .970( .951)
        TOT VOL (SCM) / SAM BLR (SCM)             394.3/ 77.45                         394.6/ 77.33
        KM  (MEASURED)                                12.07                                12.10
        FUEL CONSUMPTION L/100KM                       8.67                                 7.88

COMPOSITE RESULTS
   TEST NUMBER             6505-1                                                       3-BAG       (4-BAG)
   BAROMETER     MM HG   736.9              CARBON DIOXIDE          G/KM               221.3      ( 219.1)
   HUMIDITY      G/KG     12.0              FUEL CONSUMPTION        L/100KM              8.30      (   8.22)
   TEMPERATURE   DEG C    23.9              HYDROCARBONS (THC)      G/KM                  .22      (    .23)
                                            CARBON MONOXIDE         G/KM                  .77      (    .77)
                                            OXIDES OF NITROGEN      G/KM                  .61      (    .61)
                                            PARTICULATES            G/KM                 .140      (   .138)
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                                          FTP   - VEHICLE EMISSIONS RESULTS -80000 MILE W/O TRAP
                                                  PROJECT 05-5810-001
TEST NO.   6505-3   RUN   1
VEHICLE MODEL   82 DATSUN MAXIMA                  VEHICLE NO.65
ENGINE 2.8 L(170. CID)  6                         DATE    7/ 7/82                                  TEST WEIGHT  1531. KG( 3375. LBS)
TRANSMISSION A3                                   BAG CART NO. 1 / CVS NO. 17                      ACTUAL ROAD LOAD   7.2 KW(  9.7 HP)
                                                  DYNO NO.      2                                  DIESEL     EM-487-F
BAROMETER 743.20 MM HG(29.26 IN HG)                                                                ODOMETER 10826. KM( 6727. MILES)
RELATIVE HUMIDITY  59. PCT                        DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
BAG RESULTS                                       ABS. HUMIDITY 11.6 GM/KG
   BAG NUMBER                                                                                      NOX HUMIDITY CORRECTION FACTOR  1.03
   DESCRIPTION                                          1                     2                     3                     4
                                                  COLD TRANSIENT          STABILIZED          HOT TRANSIENT          STABILIZED
   BLOWER DIF P MM. H2O(IN. H2O)                  914.4 (36.0)          914.4 (36.0)          914.4 (36.0)          914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)                889.0 (35.0)          889.0 (35.0)          889.0 (35.0)          889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)               40.0 (104.0)          39.4 (103.0)          40.6 (105.0)          40.0 (104.0)
   BLOWER REVOLUTIONS                               4991.                 8688.                 4991.                 8637.
   TOT FLOW STD. CU. METRES(SCF)                  146.7 ( 5180.)        255.4 ( 9019.)        146.5 ( 5172.)        253.7 ( 8957.)
   THC SAMPLE METER/RANGE/PPM                     25.8/11/  26.         12.4/11/  12.         18.3/11/  18.         13.0/11/  13.
   THC BCKGRD METER/RANGE/PPM                      5.4/ 1/   5.          5.5/ 1/   6.          5.6/ 1/   6.          5.6/ 1/   6.
   CO  SAMPLE METER/RANGE/PPM                     32.3/13/  30.         17.6/13/  16.         27.1/13/  25.         17.6/13/  16.
   CO  BCKGRD METER/RANGE/PPM                       .9/13/   1.           .9/13/   1.           .7/13/   1.           .8/13/   1.
   CO2 SAMPLE METER/RANGE/PCT                     34.6/ 3/  .58         21.6/ 3/  .35         30.1/ 3/  .50         20.9/ 3/  .34
   CO2 BCKGRD METER/RANGE/PCT                      3.3/ 3/  .05          3.1/ 3/  .05          3.1/ 3/  .05          2.9/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM                     13.5/ 2/  14.          8.5/ 2/   9.         12.0/ 2/  12.          8.4/ 2/   8.
   NOX BCKGRD METER/RANGE/PPM                       .9/ 2/   1.           .7/ 2/   1.           .7/ 2/   1.           .6/ 2/   1.
   DILUTION FACTOR                                   22.95                 38.10                 26.71                 39.43
   THC CONCENTRATION PPM                             21.                    7.                   13.                    8.
   CO  CONCENTRATION PPM                             28.                   15.                   24.                   15.
   CO2 CONCENTRATION PCT                              .53                   .30                   .45                   .29
   NOX CONCENTRATION PPM                             12.6                   7.8                  11.3                   7.8
   FILTER WT. MG (EFFICIENCY, $)                  1.667 (95.)           1.026 (94.)           1.235 (97.)            .969 (95.)
   THC MASS GRAMS                                     1.74                  1.04                  1.09                  1.10
   CO  MASS GRAMS                                     4.80                  4.40                  4.01                  4.40
   CO2 MASS GRAMS                                   1423.8                1415.6                1211.4                1364.0
   NOX MASS GRAMS                                     3.66                  3.94                  3.27                  3.91
   PARTICULATE MASS GRAMS                             1.10                   .76                   .82                   .67

   THC  GRAMS/KM                                       .30                   .17                   .19                   .18
   CO   GRAMS/KM                                       .83                   .70                   .69                   .70
   CO2  GRAMS/KM                                     245.8                 225.7                 209.1                 217.5
   NOX  GRAMS/KM                                       .63                   .63                   .56                   .62
   FUEL CONSUMPTION BY CB L/100KM                     9.23                  8.45                  7.84                  8.15

   RUN TIME                SECONDS                    505.                  868.                  505.                  868.
   MEASURED DISTANCE       KM                         5.79                  6.27                  5.79                  6.27
   SCF, DRY                                           .976                  .978                  .976                  .978
        DFC, WET (DRY)                                          .977                                        .977
        TOT VOL (SCM) / SAM BLR (SCM)                        .967( .949)                                 .970( .952)
        KM  (MEASURED)                                     402.1/ 77.04                                400.1/ 76.95
        FUEL CONSUMPTION L/100KM                               12.07                                       12.07
                                                                8.83                                        8.00
COMPOSITE RESULTS
   TEST NUMBER               6505-3
   BAROMETER       MM HG      743.2
   HUMIDITY        G/KG        11.6
   TEMPERATURE     DEG C       24.4
                                                                     CARBON DIOXIDE            G/KM        3-BAG        (4-BAG)
                                                                     FUEL CONSUMPTION          L/100KM     225.3       ( 222.9)
                                                                     HYDROCARBONS (THC)        G/KM         8.45       (  8.36)
                                                                     CARBON MONOXIDE           G/KM          .20       (   .20)
                                                                     OXIDES OF NITROGEN        G/KM          .73       (   .73)
                                                                     PARTICULATES              G/KM          .61       (   .61)
                                                                                                             .141      (  .137)
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                                    FTP   - VEHICLE EMISSIONS RESULTS -8000 KM W/TRAP
                                             PROJECT 05-5810-001
TEST NO.   6505T1   RUN   1
VEHICLE MODEL   82 DATSUN MAXIMA           VEHICLE NO.65
ENGINE 2.8 L(170. CID) 6                   DATE    6/11/82                      TEST WEIGHT  1531. KG( 3375. LBS)
TRANSMISSION A3                            BAG CART NO. 1 / CVS NO. 17          ACTUAL ROAD LOAD    7.2 KW(  9.7 HP)
                                           DYNO NO.     2                       DIESEL     EM-487-F
BAROMETER 741.43 MM HG(29.19 IN HG)                                             ODOMETER 10651. KM( 6618. MILES)
RELATIVE HUMIDITY  57. PCT                 DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
BAG RESULTS                                ABS. HUMIDITY 11.9 GM/KG
   BAG NUMBER                                                                   NOX HUMIDITY CORRECTION FACTOR  1.04
   DESCRIPTION                                   1                  2                  3                  4
                                          COLD TRANSIENT       STABILIZED        HOT TRANSIENT        STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)          914.4 (36.0)       914.4 (36.0)       914.4 (36.0)       914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)        889.0 (35.0)       889.0 (35.0)       889.0 (35.0)       889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)       38.9 (102.0)       39.4 (103.0)       44.4 (112.0)       39.4 (103.0)
   BLOWER REVOLUTIONS                       4985.              8570.              4986.              8576.
   TOT FLOW STD. CU. METRES(SCF)          146.4 ( 5168.)     251.3 ( 8872.)     144.5 ( 5102.)     251.4 ( 8878.)
   HC  SAMPLE METER/RANGE/PPM             24.4/11/  24.      11.7/11/  12.      18.3/11/  18.      12.1/11/  12.
   HC  BCKGRD METER/RANGE/PPM              4.7/ 1/   5.       4.1/ 1/   4.       4.1/ 1/   4.       7.5/ 1/   8.
   CO  SAMPLE METER/RANGE/PPM             38.2/13/  35.      21.6/13/  20.      31.8/13/  29.      21.0/13/  19.
   CO  BCKGRD METER/RANGE/PPM              1.4/13/   1.       1.8/13/   2.       1.6/13/   1.       1.8/13/   2.
   CO2 SAMPLE METER/RANGE/PCT             35.9/ 3/  .60      22.1/ 3/  .36      30.9/ 3/  .51      21.4/ 3/  .35
   CO2 BCKGRD METER/RANGE/PCT              2.9/ 3/  .04       3.0/ 3/  .05       3.0/ 3/  .05       3.1/ 3/  .05
   NOX SAMPLE METER/RANGE/PPM             12.8/ 2/  13.       7.8/ 2/   8.      11.8/ 2/  12.       8.5/ 2/   9.
   NOX BCKGRD METER/RANGE/PPM               .7/ 2/   1.        .7/ 2/   1.        .9/ 2/   1.       1.1/ 2/   1.
   DILUTION FACTOR                           22.04              37.16              25.95              38.44
   HC  CONCENTRATION PPM                     20.                 8.                14.                 5.
   CO  CONCENTRATION PPM                     33.                18.                27.                17.
   CO2 CONCENTRATION PCT                      .56                .31                .47                .30
   NOX CONCENTRATION PPM                     12.1                7.1               10.9                7.4
   FILTER WT. MG (EFFICIENCY, $)           .692 (92.)         .624 (91.)         .730 (92.)         .551 (91.)
   HC  MASS GRAMS                            1.68               1.12               1.20                .69
   CO  MASS GRAMS                            5.66               5.16               4.56               5.01
   CO2 MASS GRAMS                          1499.9             1439.0             1237.0             1377.7
   NOX MASS GRAMS                            3.54               3.56               3.15               3.72
   PARTICULATE MASS GRAMS                     .50                .45                .52                .41

   HC  GRAMS/KM                               .29                .18                .21                .11
   CO  GRAMS/KM                               .97                .82                .78                .80
   CO2 GRAMS/KM                             258.1              228.6              212.2              218.9
   NOX GRAMS/KM                               .61                .57                .54                .59
   FUEL CONSUMPTION BY CB L/100KM            9.69               8.57               7.96               8.20

   RUN TIME                  SECONDS        505.               867.               505.               867.
   MEASURED DISTANCE         KM             5.81               6.30               5.83               6.29
   SCF, DRY                                 .976               .978               .977               .979
         DFC, WET (DRY)                                .978                                  .978
         TOT VOL (SCM) / SAM BLR (SCM)             .966( .949)                           .969( .952)
         KM  (MEASURED)                           397.6/ 76.33                          395.9/ 76.37
         FUEL CONSUMPTION L/100KM                     12.11                                 12.12
                                                       9.11                                  8.09
COMPOSITE RESULTS
   TEST NUMBER                 6505T1
   BAROMETER     MM HG    741.4
   HUMIDITY      G/KG      11.9                         CARBON DIOXIDE          G/KM       3-BAG       (4-BAG)
   TEMPERATURE   DEG C     25.6                         FUEL CONSUMPTION        L/100KM    230.2       ( 227.3)
                                                        HYDROCARBONS (THC)      G/KM        8.63       (   8.53)
                                                        CARBON MONOXIDE         G/KM         .21       (    .19)
                                                        OXIDES OF NITROGEN      G/KM         .84       (    .83)
                                                        PARTICULATES            G/KM         .57       (    .57)
                                                                                            .080       (   .078)
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                              FTP   - VEHICLE EMISSIONS RESULTS -8000 KM WITH TRAP
                                       PROJECT 05-5810-001

TEST NO.   6505T2   RUN   1             VEHICLE NO.65                      TEST WEIGHT  1531. KG( 3375. LBS)
VEHICLE MODEL   82 DATSUN MAXIMA        DATE    6/14/82                    ACTUAL ROAD LOAD   7.2 KW(  9.7 HP)
ENGINE 2.8 L(170. CID) 6                BAG CART NO. 1 / CVS NO. 17        DIESEL    EM-487-F
TRANSMISSION A3                         DYNO NO.      2                    ODOMETER 10689. KM( 6642. MILES)

BAROMETER 741.43 MM HG(29.19 IN HG)     DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
RELATIVE HUMIDITY  51. PCT              ABS. HUMIDITY  9.8 GM/KG           NOX HUMIDITY CORRECTION FACTOR   .97
BAG RESULTS
   BAG NUMBER                                 1                2                 3                 4
   DESCRIPTION                          COLD TRANSIENT     STABILIZED      HOT TRANSIENT       STABILIZED

   BLOWER DIF P MM. H2O(IN. H2O)         914.4 (36.0)     914.4 (36.0)     914.4 (36.0)      914.4 (36.0)
   BLOWER INLET P MM. H2O(IN. H2O)       889.0 (35.0)     889.0 (35.0)     889.0 (35.0)      889.0 (35.0)
   BLOWER INLET TEMP. DEG. C(DEG. F)      38.3 (101.0)     38.3 (101.0)     38.9 (102.0)      39.4 (103.0)
   BLOWER REVOLUTIONS                       4986.            8563.            4980.             8577.
   TOT FLOW STD. CU. METRES(SCF)         146.3 ( 5166.)   251.2 ( 8872.)   145.9 ( 5153.)    251.0 ( 8863.)
   HC   SAMPLE METER/RANGE/PPM           28.1/11/  28.    13.5/11/  13.    22.2/11/  22.     15.1/11/  15.
   HC   BCKGRD METER/RANGE/PPM            7.2/ 1/   7.     6.3/ 1/   6.     6.3/ 1/   6.      6.0/ 1/   6.
   CO   SAMPLE METER/RANGE/PPM           36.8/13/  34.    20.5/13/  19.    32.7/13/  30.     20.0/13/  18.
   CO   BCKGRD METER/RANGE/PPM             .9/13/   1.     1.3/13/   1.      .5/13/   0.       .5/13/   0.
   CO2 SAMPLE METER/RANGE/PCT            36.1/ 3/  .61    21.3/ 3/  .34    30.4/ 3/  .50     20.8/ 3/  .34
   CO2 BCKGRD METER/RANGE/PCT             2.8/ 3/  .04     2.7/ 3/  .04     2.9/ 3/  .04      2.8/ 3/  .04
   NOX SAMPLE METER/RANGE/PPM            12.8/ 2/  13.     7.7/ 2/   8.    11.2/ 2/  11.      7.7/ 2/   8.
   NOX BCKGRD METER/RANGE/PPM             1.8/ 2/   2.      .7/ 2/   1.      .7/ 2/   1.       .6/ 2/   1.
   DILUTION FACTOR                          21.90            38.62            26.38             39.58
   HC   CONCENTRATION PPM                   21.               7.              16.                9.
   CO   CONCENTRATION PPM                   32.              17.              29.               17.
   CO2 CONCENTRATION PCT                    .56              .30              .46               .29
   NOX CONCENTRATION PPM                   11.1              7.0             10.5               7.1
   FILTER WT. MG (EFFICIENCY, $)         .613 (88.)       .622 (89.)       .802 (94.)        .607 (93.)
   HC   MASS GRAMS                          1.79             1.06             1.36              1.34
   CO   MASS GRAMS                          5.51             5.01             4.92              5.07
   CO2 MASS GRAMS                         1513.2           1396.4           1229.4            1348.9
   NOX MASS GRAMS                           3.01             3.27             2.85              3.31
   PARTICULATE MASS GRAMS                    .45              .47              .57               .44

   HC   GRAMS/KM                             .31              .17              .24               .21
   CO   GRAMS/KM                             .96              .80              .85               .81
   CO2 GRAMS/KM                            262.3            222.1            212.4             216.0
   NOX GRAMS/KM                              .52              .52              .49               .53
   FUEL CONSUMPTION BY CB L/100KM           9.85             8.33             7.98              8.11

   RUN TIME              SECONDS           505.             866.             504.              868.
   MEASURED DISTANCE     KM                 5.77             6.29             5.79              6.25
   SCF, DRY                                 .978     .979     .980             .979     .980     .980
        DFC, WET (DRY)                           .967( .951)                       .970( .954)
        TOT VOL (SCM) / SAM BLR (SCM)           397.5/ 76.64                      397.0/ 76.76
        KM  (MEASURED)                              12.06                             12.03
        FUEL CONSUMPTION L/100KM                     9.06                              8.05

COMPOSITE RESULTS                                                                      3-BAG      (4-BAG)
   TEST NUMBER             6505T2                   CARBON DIOXIDE        G/KM         227.7      ( 225.9)
   BAROMETER       MM HG   741.4                    FUEL CONSUMPTION      L/100KM       8.55      (  8.48)
   HUMIDITY        G/KG      9.8                    HYDROCARBONS (THC)    G/KM           .22      (   .23)
   TEMPERATURE     DEG C    23.9                    CARBON MONOXIDE       G/KM           .84      (   .85)
                                                    OXIDES OF NITROGEN    G/KM           .51      (   .52)
                                                    PARTICULATES          G/KM          .082      (  .081)
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